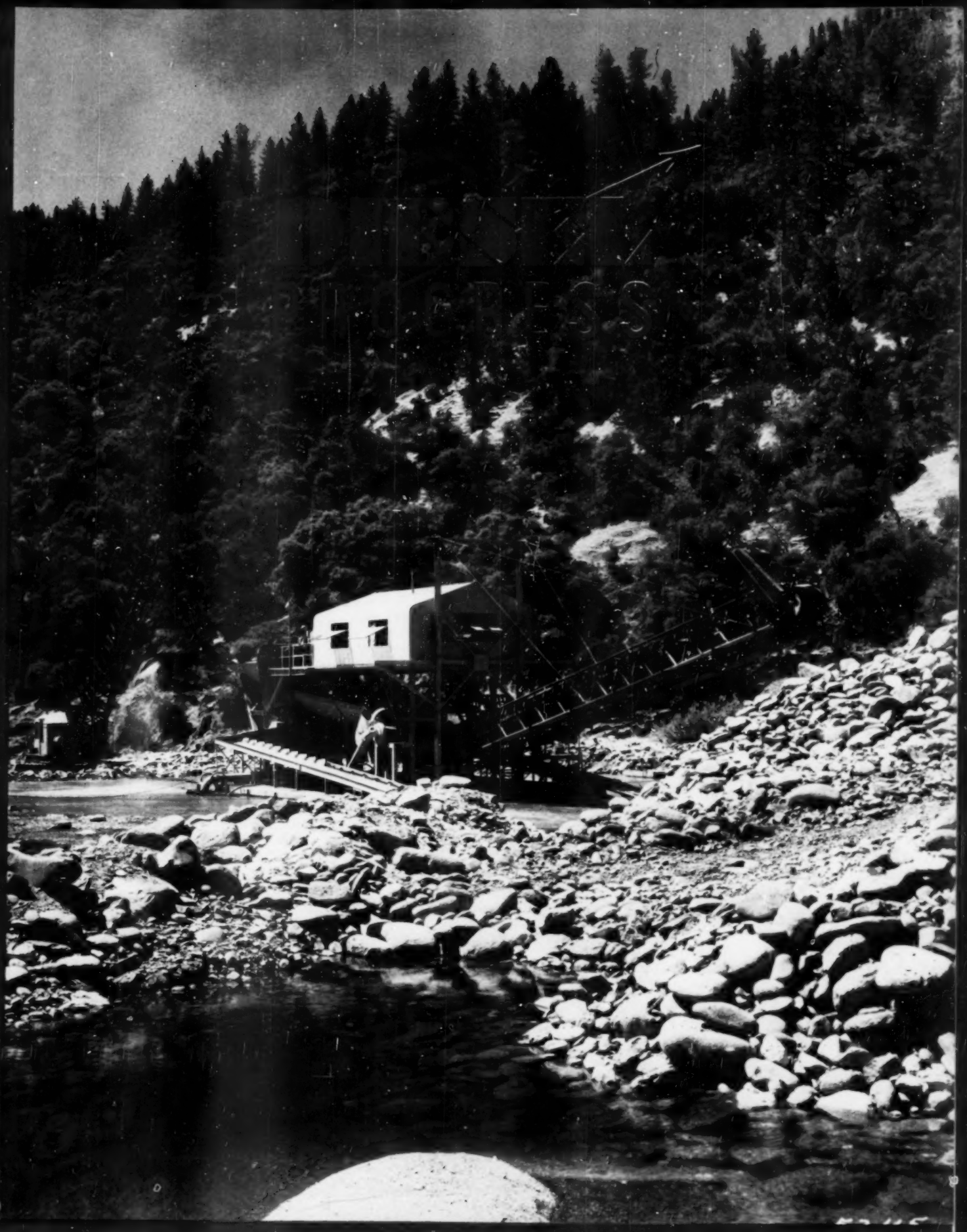
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



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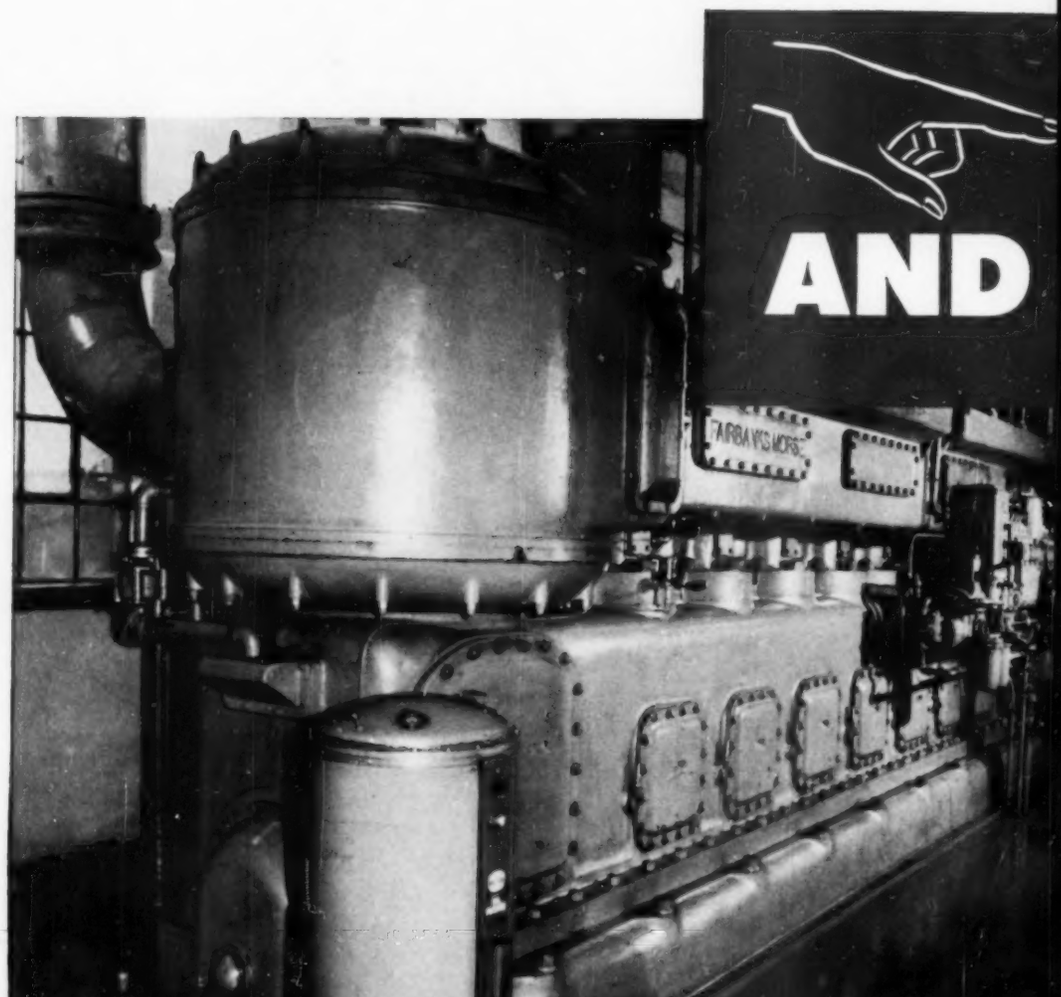

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TEXACO STAR THEATER
starring MILTON BERLE
on television
every Tuesday night.
See newspaper for
time and station.

TEXACO

TEXACO

DIESEL PROGRESS for November, 1950. Volume XVI, Number 11. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 816 North La Cienega Boulevard, Los Angeles 46, California. Rex W. Wadman, President. Subscription rates: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., authorized.

TAKE 1 STEP REDUCE 2 COSTS

Down go fuel consumption and upkeep expense when you lubricate your Diesels with TEXACO URSA OILS

TAKE that cost-saving step today. Lubricate your Diesels with *Texaco Ursa Oils* and note how much less fuel you use. Note, at the next scheduled overhaul, how clean your engines are, how free of harmful carbon and sludge deposits. *Texaco Ursa Oils* keep your engines really clean.

Made especially for Diesel lubrication, *Texaco Ursa Oils* have outstanding resistance to oxidation. Their tough, protective lubricating films hold up under the severest operating conditions. Parts last longer. Engines run better, maintenance costs come down.

Leading Diesel manufacturers approve *Texaco Ursa Oils* and they are available in every needed viscosity. They are by far America's No. 1 Diesel lubricating oils. In fact –

More stationary Diesel h.p. in the U. S. is lubricated with Texaco Ursa Oils than with any other brand.

A Texaco Lubrication Engineer will gladly show you how *Texaco Ursa Oils* can improve your Diesel operation. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

ATLAS
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Joining Two Great Names in Engines
Superior . . . Atlas . . . two world-famous lines of engines . . . now united by the purchase of the manufacturing rights of Atlas Diesel Engines by The National Supply Company.
Present owners of Superior and Atlas engines will benefit from the expanded sales, service, and shop facilities of the combined companies . . . from Alaska to Mexico and from Nova Scotia to Texas.
Manufacture of both lines of engines will continue on the same high standards as in the past. Production of both lines will be combined in Superior's modern 15-acre plant at Springfield, Ohio. The outstanding features of both Superior and Atlas engines will continue to make these two lines of engines the greatest values in their fields.
If you contemplate the purchase of engines, you will find the type and size to meet your requirements exactly in the complete Superior-Atlas line. Write for the location of the sales-service station nearest you.
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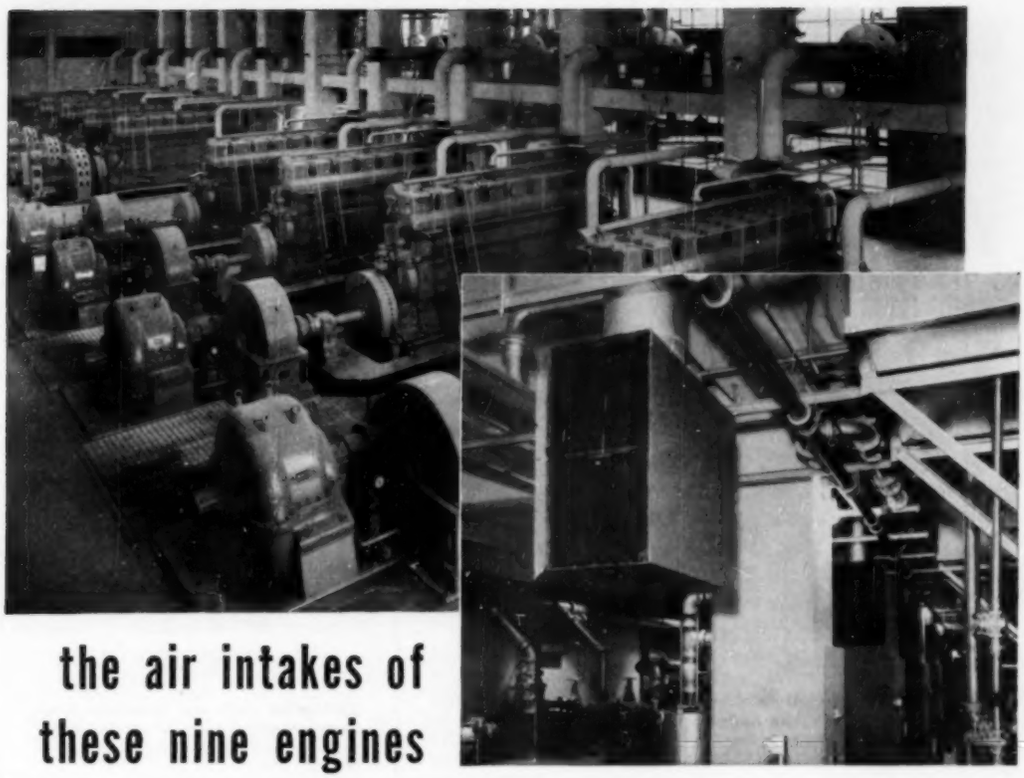

the air intakes of these nine engines have **AAF FILTER PROTECTION** at Hyperion Sewage Disposal Plant

THE HYPERION SEWAGE DISPOSAL PLANT in Los Angeles is one of the finest systems of its kind in the world. No expense has been spared in the facilities or equipment—AAF Electro-Matic Self-Cleaning Electronic Precipitators were used to provide super-clean air for the activated sludge process—AAF Type OCH Filters were selected to clean the intake air for the nine big engines that serve the power needs of this plant.

Type OCH is one of several types of AAF filters designed for cleaning the intake air for engines and compressors. At Hyperion they clean inside air which has already been cleaned by the ventilating filters—proof of AAF's high efficiency in removing dust and dirt from the air.

Any expensive engine needs the kind of protection AAF can deliver. And if you have a special problem, just call on AAF's engineers. Their experience has benefited thousands.

WRITE TODAY for complete information on the different types of AAF filters for engines you build, own or operate.

Today's Best Buy is Better Air!

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To damp vibration . . .

GUN IRON CASTINGS

IN designing machinery and equipment of all types, it is important to keep vibration at the minimum for maximum accuracy and for longest life of working parts. That is one of the reasons that Gun Iron is often chosen for machine tool castings . . . its dense microstructure has unusual damping effect on vibration. Another important factor is that Gun Iron does not change materially in high heat . . . at 900° F., it grows only ¼ of 1% in linear measurements. It has remarkable impact strength and many other properties superior to those of other irons.

Another important consideration for selecting Gun Iron is the unusual facilities found at Hunt-Spiller for producing large, accurate cast parts. Complete engineering, metallurgical and laboratory facilities are at your disposal to help you in design and operating problems. Complete quality control is assured because Gun Iron is produced in our own air furnaces, cast in our modern foundry and even can be machined in our extensive machining plant.

Whether your cast parts must damp vibration, resist frictional wear, prolonged heats and pressure or just be uniform in chemical and physical properties, it will pay you to investigate Gun Iron. Gun Iron has been doing an outstanding job on the toughest casting assignments for over 139 years.

GUN IRON *in the* DIESEL FIELD

Hunt-Spiller casts and machines many important diesel parts for leading diesel engine manufacturers. A few are listed below:

MAIN CYLINDER LINERS • CYLINDER HEADS • PISTONS AND H-S DOUBLE SEAL RINGS • WATER JACKETS • PRESSURE CASTINGS

Chances are that there are many other places where Gun Iron can solve a design or operating problem. To help you determine the value of Gun Iron for your cast parts, our metallurgical department has prepared a comprehensive bulletin which contains complete properties and discussions of Gun Iron and many other metals. Engineers claim it an invaluable reference aid. Send for your free copy today.

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STANDARD ENGINEER'S REPORT

DATA

PRODUCT Chevron Starting Fluid

UNITS A.C. diesel engines HD-7 tractors

CONDITIONS 25° below zero weather—parked in open shed

EQUIPMENT Permanent primer with atomizers on blower

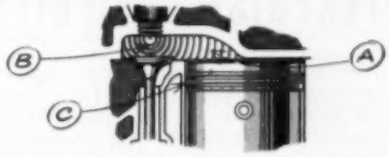
FIRM John W. Graves Heppner, Oregon

Engine starts on first turn at 25° below zero!

CHEVRON STARTING FLUID started this engine instantly every time during a severe Oregon winter, even when the tractor had been idle for several days in temperatures down to 25° below zero! John W. Graves, owner, says, "Power in the starter battery would last only for two or three revolutions of the engine, but Chevron Starting Fluid required only one turn to kick it off." With one or two strokes of the dash-mounted pump, fluid was forced from the storage tank (left center) into the "blower", before the starter button was pushed.

ATOMIZER NOZZLES, as shown on this diesel "blower", are also used to inject Chevron Starting Fluid into intake manifolds of gasoline engines. Complete primer equipment may be purchased from your fluid supplier. Chevron Starting Fluid comes in 3-pint cans, and capsules of two sizes—7CC's and 17CC's, packed 12 and 24 per can. It is approved by leading engine manufacturers.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides powerful, easily fired vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—prevent cylinder wear and ice formation in primer equipment.

HOT NEWS — COLD ENGINES

FREE BOOKLET gives you more facts on Chevron Starting Fluid—shows where it should be applied in different type engines. Write or ask for it today.

CHEVRON STARTING FLUID

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FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

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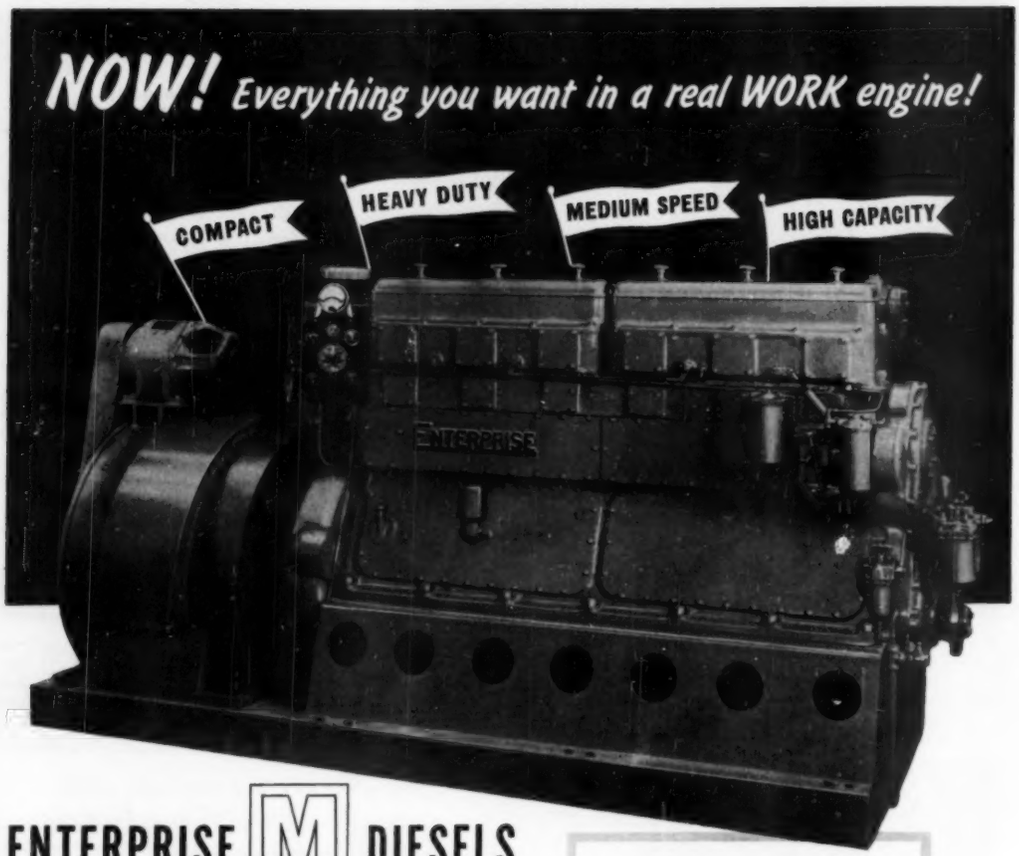
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

NOW! Everything you want in a real WORK engine!



ENTERPRISE M SERIES DIESELS

Designed and developed to meet the demand for tough and continuous operation at medium speeds, Enterprise M Series Diesels in 3, 4 and 6 cylinder models are now available for the most economical solution to your power requirements using a wide range of low grade fuels. Compact, portable or completely contained if desired, these units deliver 68 to 240 BHP at conservative speeds of 450 to 750 RPM. They are WORK engines, capable of thousands of hours in demanding service, at low operating cost, with minimum maintenance and servicing requirements. When you compare, feature for feature, you're sure to make your next diesel a medium speed, high capacity Enterprise M engine—for years of the smoothest power you've ever enjoyed.

If you want 68 to 240 BHP, you'll get more for your money with an Enterprise 3, 4, or 6 cylinder M Series Diesel.

- 8" bore x 10" stroke
- Compact, medium speed, heavy duty
- Easy starting, air or electric
- Operates on low cost non-premium fuels
- Low fuel consumption
- Smooth, quiet, clean operation

Enterprise STATIONARY Diesels

Write for new Enterprise M Series Bulletin No. M-16, or call your nearest Enterprise office for complete information.

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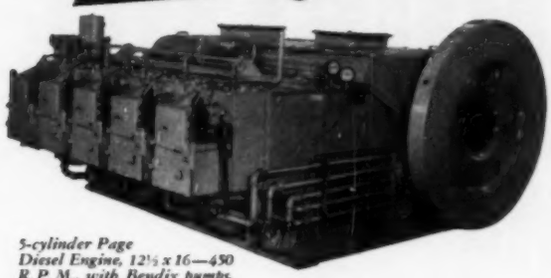
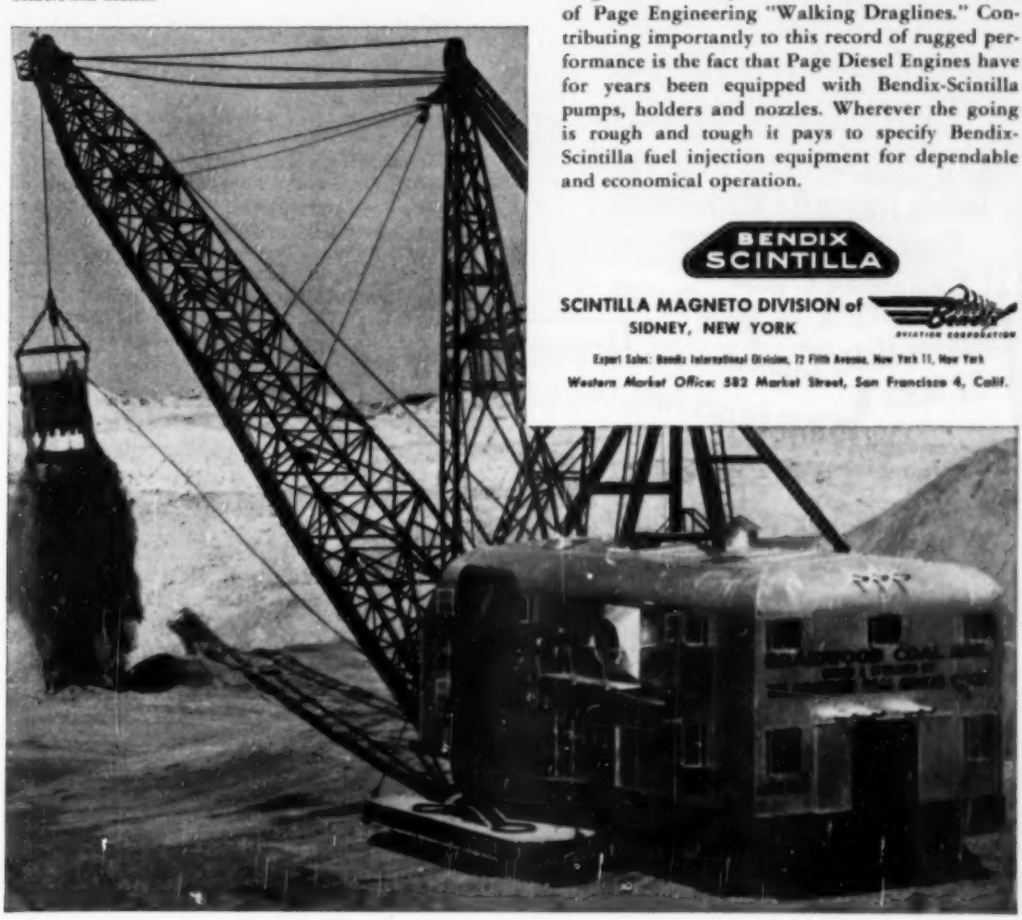
WHERE IT'S *Rough and Tough!*



5-cylinder Page Diesel Engine, 12½ x 16—450 R. P. M., with Bendix pumps, holders and nozzles.

Page Diesel-Powered "Walking Draglines" Use Bendix-Scintilla Fuel Injection Equipment

Day in, day out, dependable operation on the toughest kind of jobs—that's the work schedule of Page Engineering "Walking Draglines." Contributing importantly to this record of rugged performance is the fact that Page Diesel Engines have for years been equipped with Bendix-Scintilla pumps, holders and nozzles. Wherever the going is rough and tough it pays to specify Bendix-Scintilla fuel injection equipment for dependable and economical operation.



BENDIX SCINTILLA

SCINTILLA MAGNETO DIVISION of Bendix AVIATION CORPORATION
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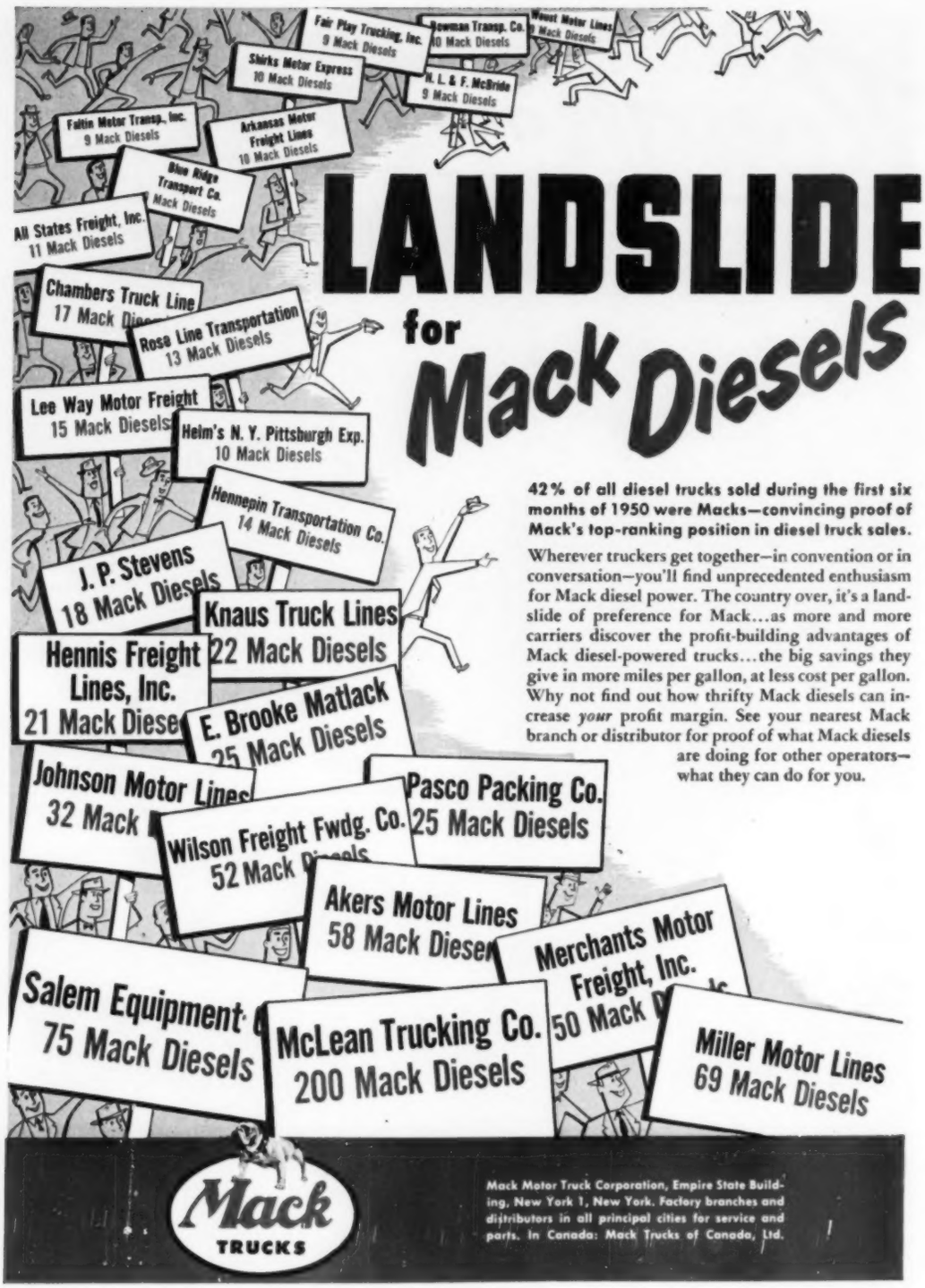


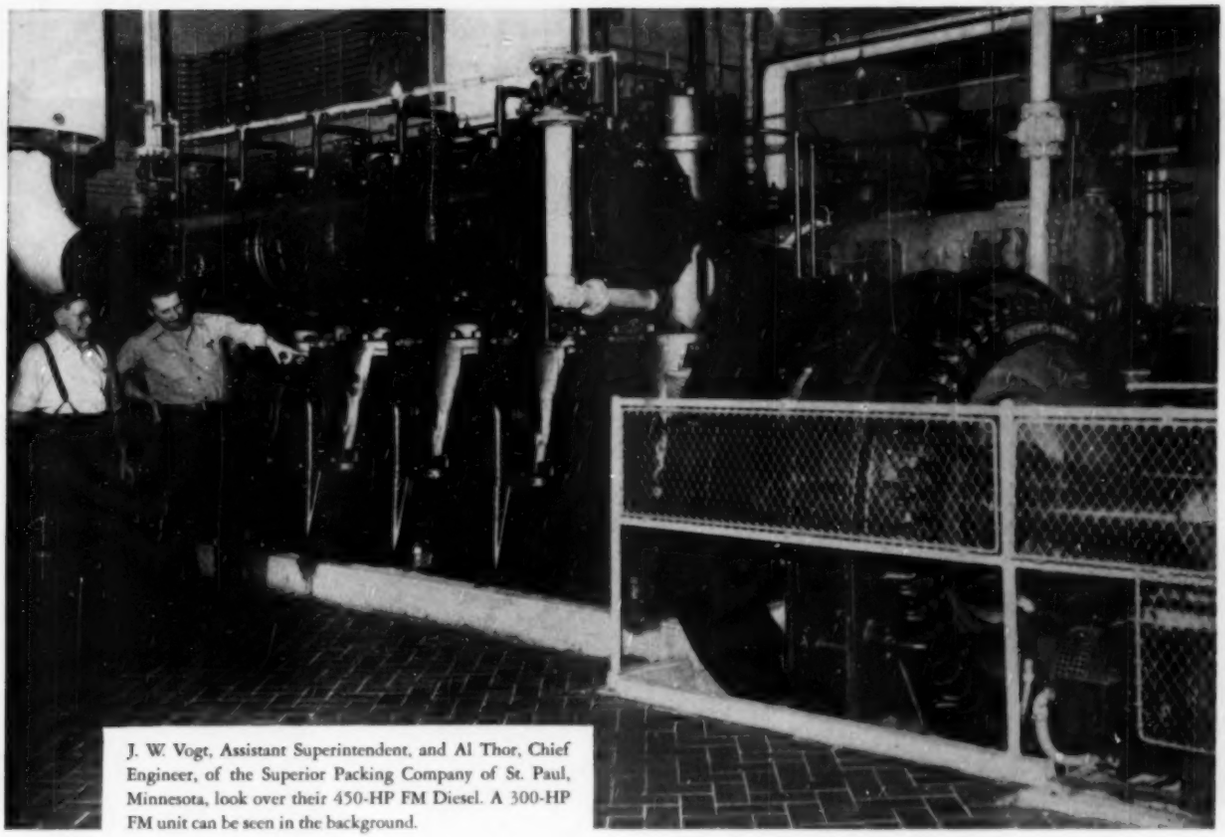
LANDSLIDE for Mack Diesels

42% of all diesel trucks sold during the first six months of 1950 were Macks—convincing proof of Mack's top-ranking position in diesel truck sales.

Wherever truckers get together—in convention or in conversation—you'll find unprecedented enthusiasm for Mack diesel power. The country over, it's a landslide of preference for Mack…as more and more carriers discover the profit-building advantages of Mack diesel-powered trucks…the big savings they give in more miles per gallon, at less cost per gallon. Why not find out how thrifty Mack diesels can increase *your* profit margin. See your nearest Mack branch or distributor for proof of what Mack diesels are doing for other operators—what they can do for you.

Mack TRUCKS

Mack Motor Truck Corporation, Empire State Building, New York 1, New York. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.



J. W. Vogt, Assistant Superintendent, and Al Thor, Chief Engineer, of the Superior Packing Company of St. Paul, Minnesota, look over their 450-HP FM Diesel. A 300-HP FM unit can be seen in the background.

How they lightened load troubles . . .

A 300-HP FM Diesel was hard pressed to meet growing power demands of the Superior Packing Company, St. Paul, Minnesota. The punishing operation began to take its toll in engine deposits, stuck rings, and excessive wear.

The troubles persisted despite the use of various conventional and detergent-type lubricants. Then operators took the advice of a Standard Oil lubrication specialist and switched the engine to STANDARD HD Diesel Oil, a truly heavy-duty lubricant with effective detergent qualities and high oxidation resistance.

It worked! Ring sticking and deposit troubles were eliminated. Wear was kept to a minimum. *There were no maintenance troubles despite continuous hard service.* When a new 450-HP FM Diesel was subsequently installed, operators gave the lubrication job to STANDARD HD Diesel Oil.

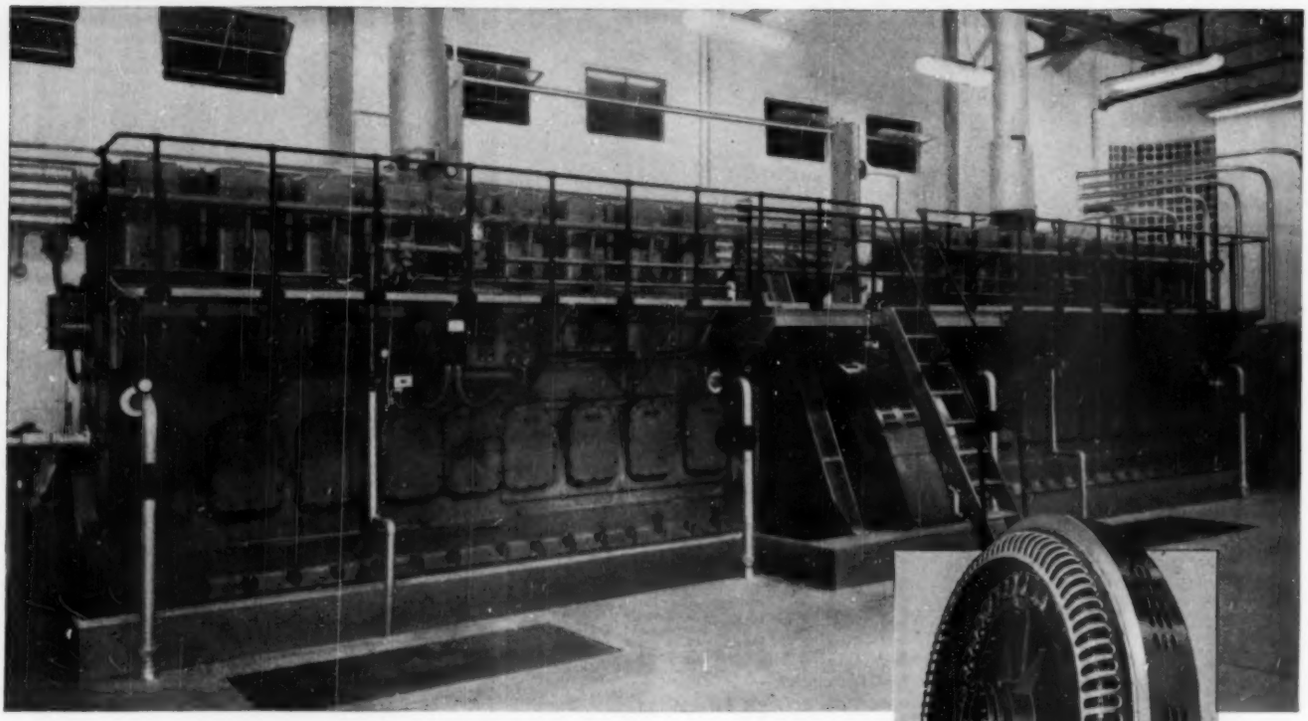
The same STANDARD HD qualities that stopped troubles in this heavily loaded engine can help you improve Diesel economy in any type of service. A trial will prove it. To help you make still other savings, Standard Oil has a specially trained and experienced lubrication specialist located near your plant. His headquarters are the nearest Standard Oil (Indiana) office. Phone him there or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

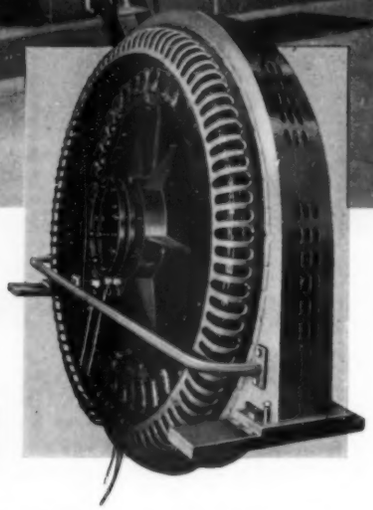
STANDARD HD Diesel Oil

STANDARD OIL COMPANY (INDIANA) STANDARD

YOU CAN BE **SURE**.. IF IT'S

Westinghouse





What you can't see...the PLUS added by Westinghouse Engineering

The only job of those big twin diesels, pictured above, is driving the Westinghouse A-C Generator almost lost in between them. An unusual installation—the first of its kind. Like many firsts, it too, presented problems. Insulating against the flow of shaft currents was one of them. Coupling the shaft looked like the answer—*if* an insulated coupling could stand up to the terrific driving force of the twins . . . *if* it lost no torque . . . *if* it could take it for at least a year without maintenance.

The engine builders asked Westinghouse, suppliers of the generator, to tackle the problem.

Westinghouse engineers designed an insulated coupling that did the job—and more, paving the way for future installations of this type.

This example shows the problem-solving ability offered by Westinghouse in building special generators for unusual applications.

Make certain you get the benefit of Westinghouse engineering on your next equipment. Power Apparatus Specialists—in principal cities—will help you select and apply the right equipment to the job. Consult them for any present or future plans. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21571

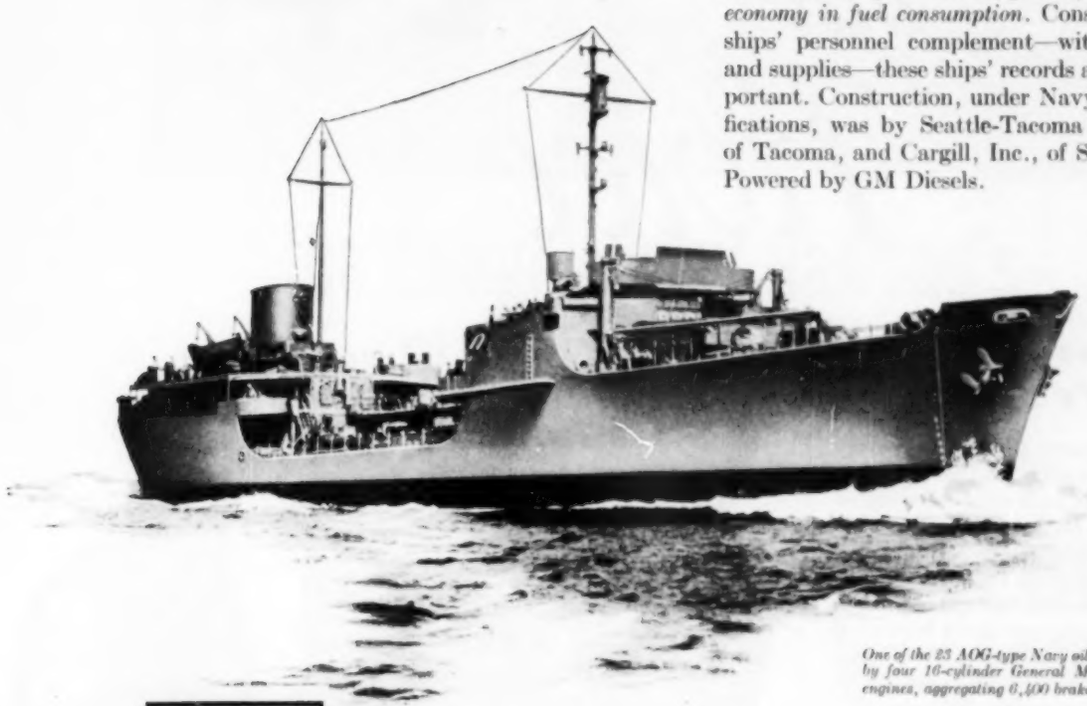
Westinghouse

DIESEL ENGINE DRIVEN AC GENERATORS

23 Fast Tankers

all with General Motors Diesel-Electric Drive!

PROOF of the economy and efficiency of Diesel-Electric Drive is provided by the Navy AOG-type oilers. Built to transport fuel and lube oil for aviation and small craft use, these medium-sized tankers carry 2,000-ton cargoes at 14½ knots—*with remarkable economy in fuel consumption*. Considering the size of ships' personnel complement—with necessary space and supplies—these ships' records are all the more important. Construction, under Navy design and specifications, was by Seattle-Tacoma Shipbuilding Co., of Tacoma, and Cargill, Inc., of Savage, Minnesota. Powered by GM Diesels.



One of the 23 AOG-type Navy oilers, powered by four 16-cylinder General Motors Diesel engines, aggregating 6,400 brake H.P.

ENGINES FROM 150 TO 2000 H.P.

GM GENERAL MOTORS DIESEL POWER

Cleveland Diesel Engine Division

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GENERAL MOTORS

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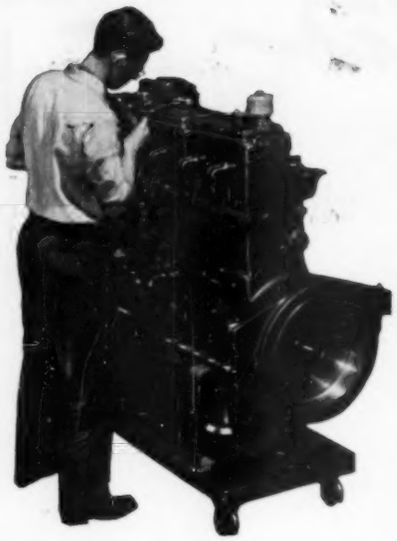
Cummins® Custom-built Diesels

Built not once but Twice

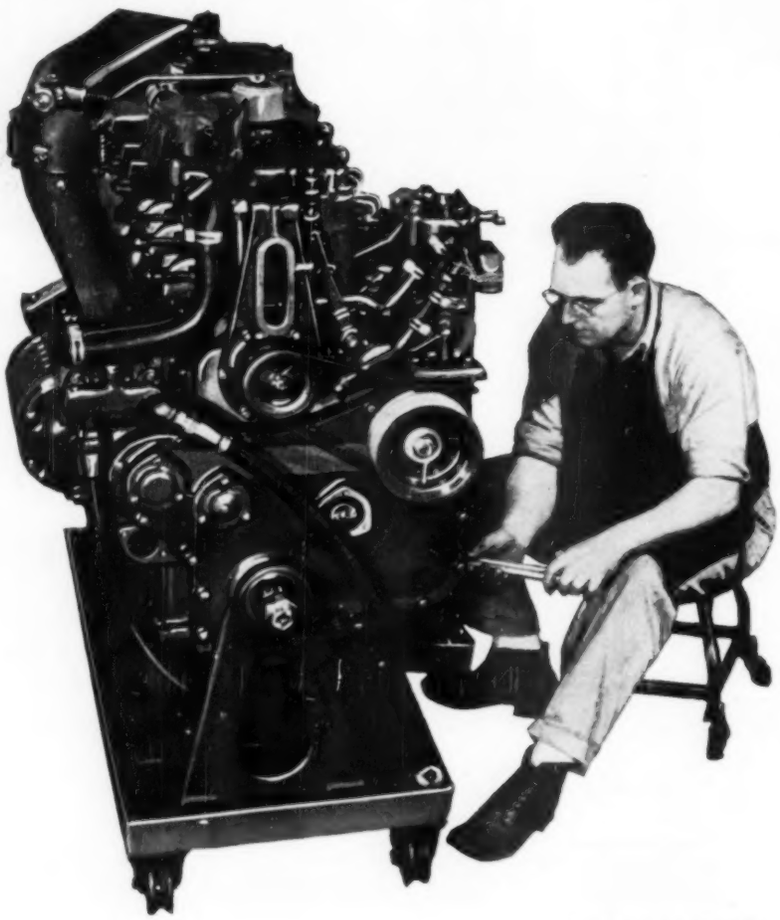


Delivers power at lower cost because it's better built

There's more *useful* power *life* built into every lightweight, high-speed Cummins Diesel, because every engine is actually built *twice*. After initial assembly, each engine is run in on the test block. Then it is torn down and carefully re-inspected—after that it is re-assembled and tested *again*.

Extra care is maintained throughout production. This precision, plus such *extra* features as the Cummins exclusive fuel system, means peak performance, less "down-time" and more rugged, dependable power for every fuel dollar spent.

There's a model engineered for your power needs. Contact your Cummins dealer. He has more facts to show you about making more profits with . . .



Diesel power by CUMMINS

CUMMINS Diesel

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EXPORT: CUMMINS DIESEL EXPORT CORPORATION
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Lightweight High-speed Diesel Engines (50-550 hp) for: On-highway trucks • off-highway trucks • buses • tractors • earth-movers • shovels • cranes • industrial locomotives • air compressors logging yarders and loaders • drilling rigs • centrifugal pumps generator sets and power units • work boats and pleasure craft.

TIDE WATER ASSOCIATED Salutes...

the Lehigh Valley Railroad's New Diesel-Electric Tug Fleet

The most modern tug fleet in New York Harbor... part of Lehigh Valley's forward thinking in supplanting outmoded equipment with faster, more economical motive power on both land and water.

Tide Water Associated is proud that the Lehigh Valley Railroad selected Tycol Diesel oils and fuels to service these outstandingly fine boats.

Thoroughly familiar with the problems involved in Diesel engine operation, Tide Water Associated has worked uninterruptedly for many years to develop new and better lubricating oils and fuels for more efficient and economical operation.

There is a complete line of Tycol lubricants... over which Tide Water Associated has complete control... from drilling field, through transportation to refineries, where only the most advanced refining processes are employed. This complete control enables Tide Water Associated to produce exceptional high-quality, specialized oils that provide peak efficiency and lowest operating costs.

For example, the new Tycol Adeltran Oils were developed expressly to meet the specific needs of railroad, and certain marine and stationary Diesel operation.

Your nearest Tide Water Associated office will gladly help you select the lubricant... or fuel oil... best suited to the requirements of your particular operation.

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh • Philadelphia • Chicago
Detroit • Tulsa • Cleveland
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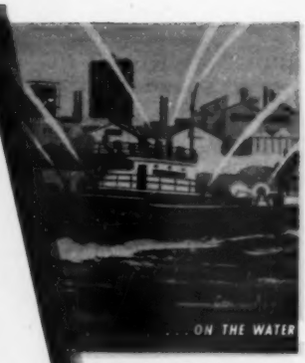
TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE - NEW YORK 4, N.Y.

This is the Diesel

that slashed power costs



COST-WISE power users know there is a big difference in Diesel engines. They've learned from experience that the GM 2-cycle Diesel gives them the full advantages of this versatile modern power.

The GM Series 71 Diesel—the successful engine that powers over 22,250 city and inter-city buses—also powers a rapidly increasing number of heavy-duty trucks. Operators prefer them because the engines perform a million miles or better with spectacular savings in operating and maintenance costs.

It is this same engine, in single and multiple units, that has made Diesel power famous for economy in every type of power application—from giant shovels to road pavers—from tractors to cotton gins—from oil drilling rigs to pipeline pumps—from workboats to pleasure craft—from industrial locomotives to welding sets—from lumbering machinery to standby generators.

This is because GM two-cycle Diesels deliver power on every piston downstroke—not on every second downstroke like most other Diesels. This makes them smoother, more flexible under loads, easier starting, cleaner burning, lighter in weight—and compact enough to fit almost any installation.

Just any Diesel is not the answer—*the* Diesel is the GM Diesel! 299,975 "Series 71's" have provided the best in Diesel power—*Diesel brawn without the bulk.*

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES . . . Up to 275 H. P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS . . . Up to 800 H. P.

GENERAL MOTORS

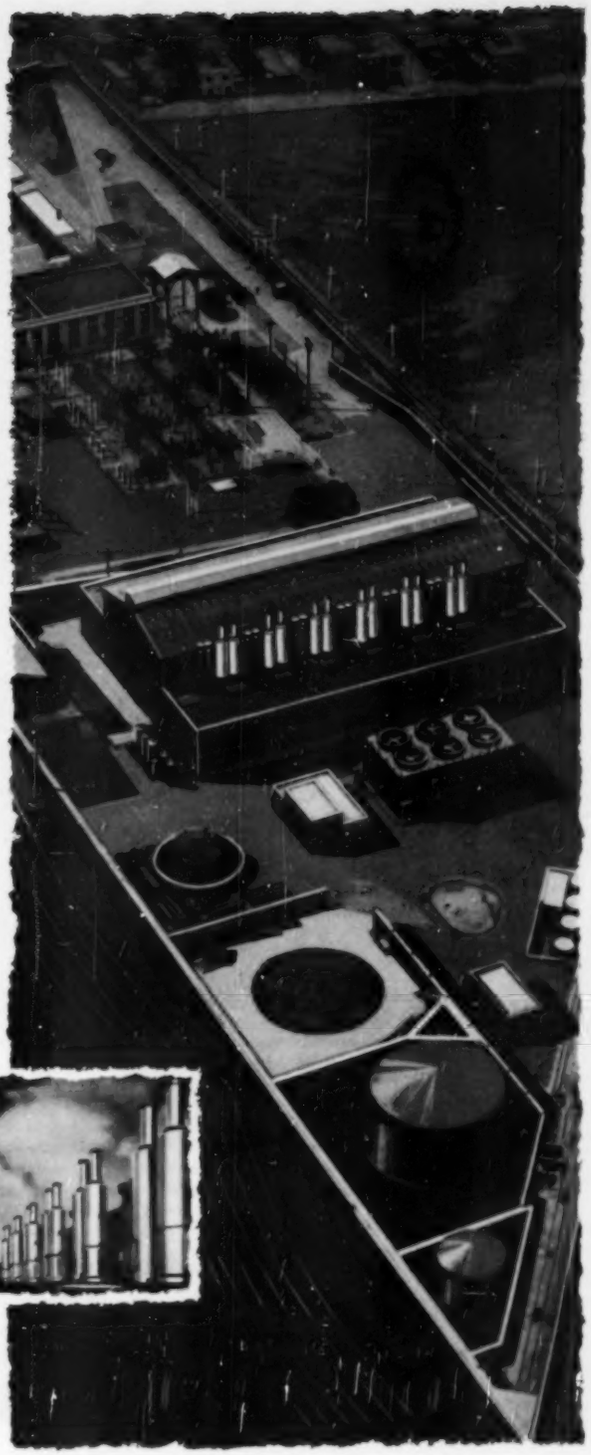
Hear HENRY J. TAYLOR on the air every Monday evening over the ABC Network, coast to coast

Only GM Diesels provide all these advantages

Smaller size, less weight per horsepower • Two-cycle smoothness, power on every downstroke • Quick starting, on its own fuel • Unit injectors—no high-pressure fuel lines • Rapid acceleration • Cleaner burning • Better high-altitude performance • Easy accessibility

GM
GENERAL MOTORS
DIESEL POWER
"Your Key to Power Economy"

Largest Diesel Powered Electric Utility Plant in the Americas has no *Diesel Noise Problems*



Snub the Slug and Stop the Noise

The Tacubaya, Mexico City, plant, one of the largest Diesel electric power plants in operation, solved its engine noise problem with Burgess-Manning Snubbers. The six Nordberg Diesels delivering a total of 44,100 hp at Mexico City altitude, are each equipped with two Burgess-Manning Intake and two Exhaust Snubbers to effectively reduce intake and exhaust noise.

The Snubbers prevent noise by smoothing the flow of intake air and dissipating the energy in the exhaust gas slugs, providing quiet operation without affecting performance.

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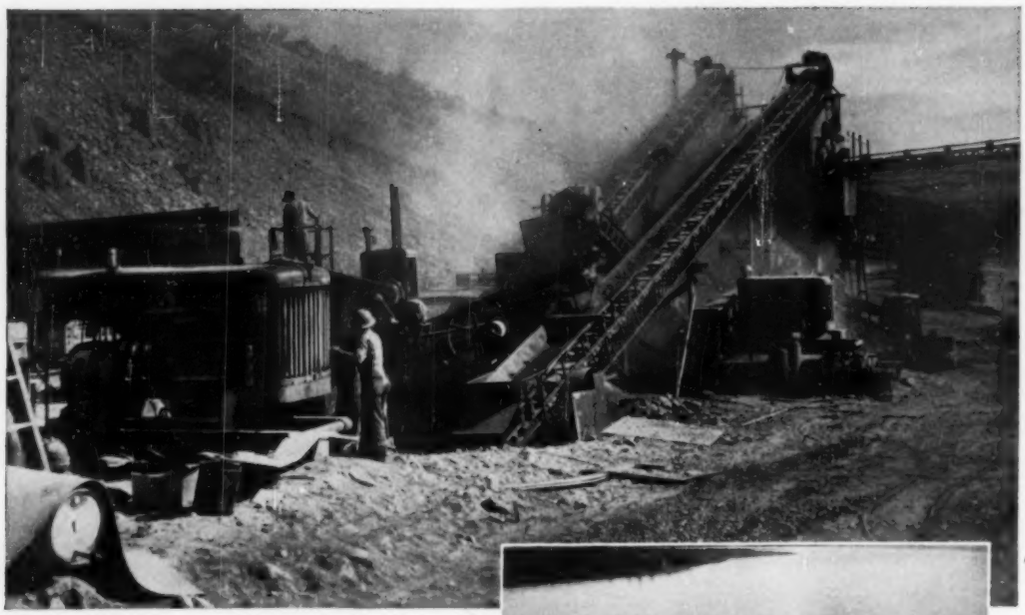

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. . . says Dave Sholseth, superintendent of Strong & McDonald's rock crusher near Monse, Washington. He knows from experience that the dependable Internationals can always be counted on to deliver thousands of work-hours without trouble.

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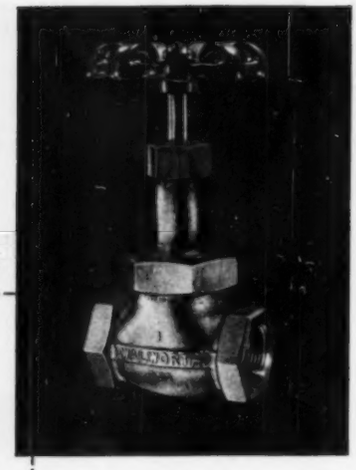

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The stainless steel, corrosion resistant seats and discs are heat treated to a hardness of 500 Brinell – hard enough to scratch glass and crush nails! The valve can be closed on sand, slag, and pipe scale without injury to the seating surfaces. "Wire drawing" is practically eliminated. All parts are accurately machined and gaged. Years of tight, positive shut-off are assured.

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*T.M. for Koppers process

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GONE are the "good old days" when the ultimate in luxury on rails was this stifling hot car with its uncomfortable wicker chairs, flickering lights and soot-grimed windows. Gone, too, are the smoke, dust and cinders and the jolting, jarring ride that made travel an uncertain pleasure back in grandpa's day.
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Latest addition to the ever-growing roster of trains powered by General Motors locomotives is the Wabash Blue Bird, operating daily between Chicago and St. Louis—with new luxury, comfort, speed and safety.

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BRYAN, OHIO pioneer user of Diesel Power

Two of the four Nordberg Diesels at Bryan are shown in this view . . . the 9-cylinder, 3600 hp unit and part of the 8-cylinder, 3200 hp unit.

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Up until 1907, the municipal plant at Bryan, Ohio used conventional steam power. But that year Bryan made news by being one of the first municipalities to adopt Diesel Engines for power generation. In the ensuing forty-three years, the use of Diesels at Bryan was steadily increased. It is significant that this pioneer Diesel user gradually replaced the older Diesel and steam units with *Nordberg* Diesels, until today it is an *all-Nordberg* powered plant.

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1933 —Installed their first Nordberg —a 1500 horsepower unit

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1939 —Installed a 3200 horsepower Nordberg Diesel

1946 —Installed their fourth Nordberg Diesel . . . a 3600 horsepower unit

*American Diesel Engine Company later became Busch-Sulzer, now a division of Nordberg

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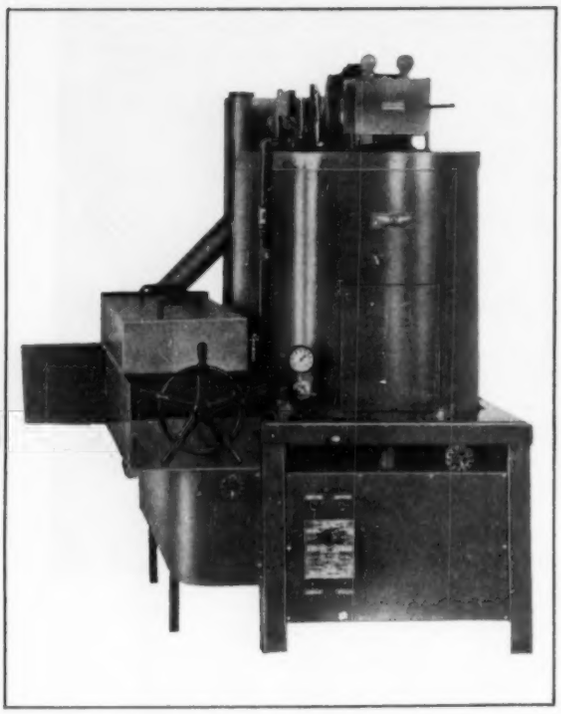

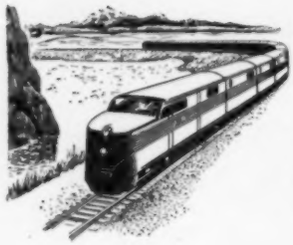

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Before	After
919*	1068*
FLASH POINT	
Before	After
407*	445*

*Average for 5 sample lots

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DIESEL POWERED SHIPS
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Yes, many railroads now pay only 15¢ per gallon, including the wages of the Re-Refiner operator, for oil which would cost 40 to 50¢ per gallon new. But they are only one of many different industries which found out that the *YM Re-Refiner paid for itself in a short time.* Why not investigate immediately?

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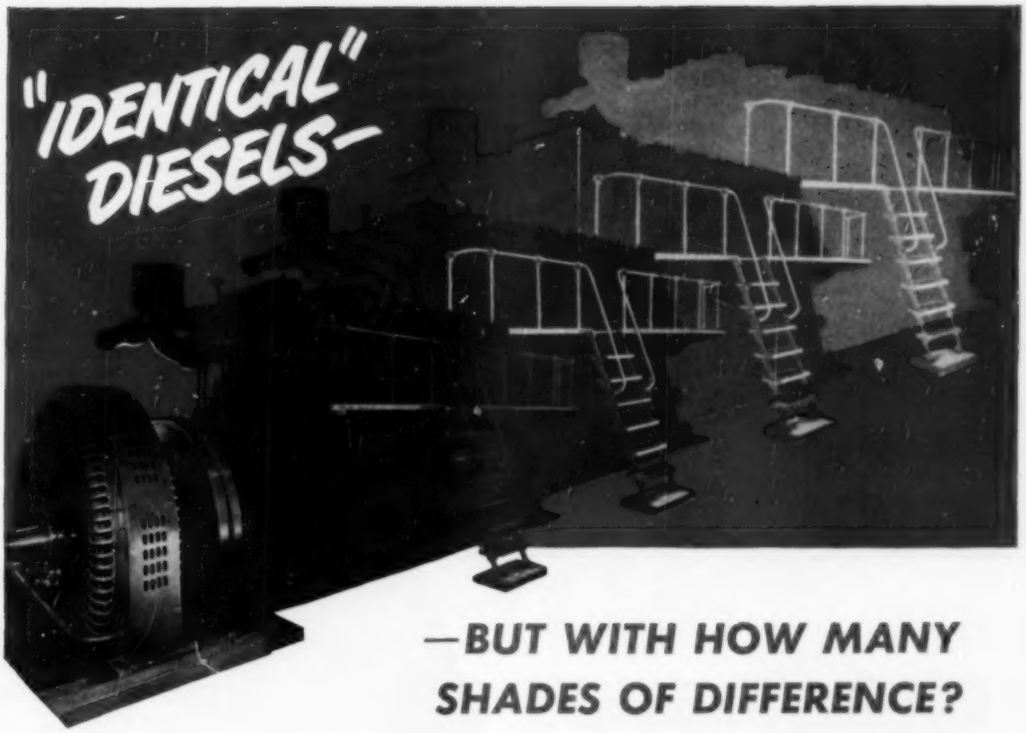

—BUT WITH HOW MANY SHADES OF DIFFERENCE?

When they're delivered to the buyers a number of Diesels may be identical in make and model. But in actual use . . . working in different plants and climates . . . differently loaded, operated and serviced . . . the "identical" Diesels soon differ even more than just a shade. That's one reason the lubrication which seems ideal in one particular case may cause a similar Diesel working elsewhere to run up unnecessary downtime.

You can guard against the adverse effects of such variables . . . against the improper lubrication of your costly Diesels . . . by calling in a Cities Service Diesel Lubrication specialist. He knows all types of Diesels and their lubrication; he knows practical plant procedure, too. That's why the Diesel lubrication schedule he will be glad to develop especially for you can provide far better protection for your Diesels—and for your profit showing. Contact the Cities Service office nearest you, or mail the coupon now for booklet on "Diesel Engine Lubrication."

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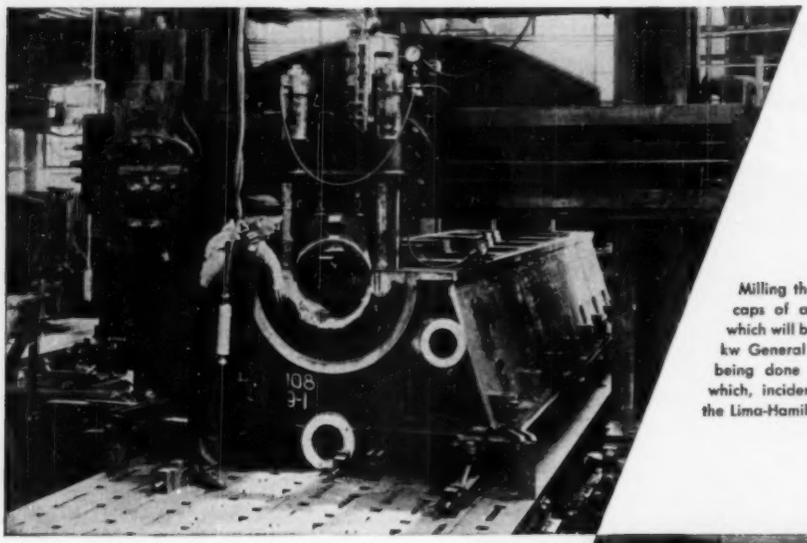
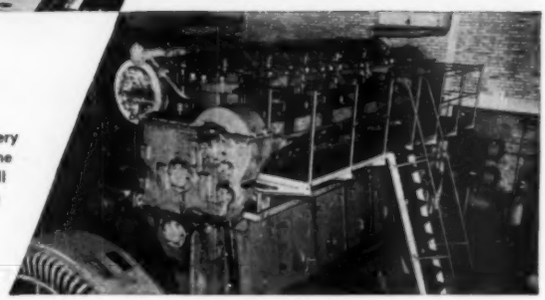


Milling the main bearing saddles and caps of a 6-cylinder Hamilton diesel which will be direct-connected to a 2000-kw General Electric generator. Work is being done on a Niles 10-foot planer which, incidentally, is also a product of the Lima-Hamilton Corporation.



The Anaconda diesel, when installed, will look very much like this 6-cylinder 2250-hp Hamilton engine at Harwood, N. D. The generator, however, will be d-c to supply power for electrolytic refining of copper.

How perfect bearing alignment is achieved on

HAMILTON DIESELS

This casting, approximately 22 feet long and weighing 20 tons, is the bed plate of a Hamilton diesel being built for Anaconda Copper Mining Company. It will be delivered late this fall, to power a General Electric 2000-kw, 250-volt, 250-rpm direct-current generator.

The significance of the photograph is this: It shows how perfect bearing alignment is achieved on Hamilton diesels.

The bed plate is completely planed. Then a milling head is mounted on the cross rail of the planer, and without disturbing the setting of the bed plate, the bearing shell saddles are milled. This is done with the caps in place—*under exactly the same conditions which prevail when the engine is operated.* Thus perfect alignment is obtained.

Such precision in manufacture pays off in lower maintenance for the user.

* * *

Hamilton diesels, with 21½ inch bore and 27½ inch stroke, are available with 5 to 12 cylinders. Ratings are 482½ bhp (net) per cylinder as a straight diesel and 455 bhp per cylinder as a dual fuel engine, both at 257 rpm. For full information, call the Lima-Hamilton Sales Offices in New York or Chicago, representatives in other cities, or write directly to Lima-Hamilton Corporation, Hamilton, Ohio.

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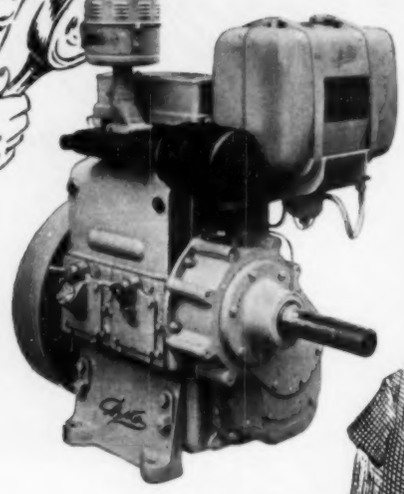
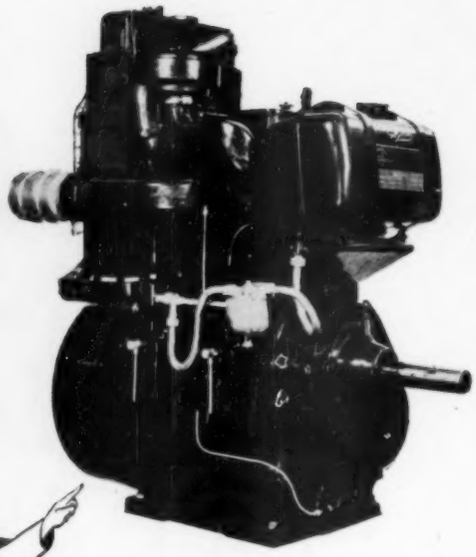
PETTER MODEL B: 2, 3 and 4 cylinders giving 18, 27 and 36 hp at 1500 rpm. Instantaneous cold starting; runs smoothly, dependably.





PETTER MODEL AV: 1 and 2 cylinders giving 5 and 10 hp at 1500 rpm. Starts quickly, easily; rugged, dependable.

Look at either model and you'll see why

Petter is Preferred!

(Engines from 5 hp to 36 hp)

Right from the word "go"—and these Petter Diesels start quickly, easily—you benefit from initial low cost, the utmost operating economy, and dependable performance when you purchase a Petter Diesel. Thanks to pound devaluated prices, Petter Diesels now are *30% to 40% lower in cost.* What's more, they actually operate at ¼ *the cost of gasoline engines.*

In 83 countries, Petter Diesels have established an enviable performance record. These ruggedly built, direct injection, 4-cycle engines give long service with an absolute minimum of maintenance. *Drive can be taken off either side at engine speed, or off timing gear side at half speed.*

Production of up to 1500 Petter Diesels weekly is the reason ABOE, Inc. can maintain a continuous supply and minimum prices through its nationwide network of competent and responsible Petter distributors. *Complete information and prices on Petter Diesels gladly sent upon request.*

Petter Diesels are ideal for Compressor Drives, Pumping Units, Road Rollers, Tractors, Stone Crushers, Concrete Mixers, Saw Benches, Refrigeration Machinery and virtually every application where a dependable source of economical power is needed. Petter Diesels available in sizes from 5 hp to 35 hp. Other ABOE, Inc. diesels up to 3,000 hp.

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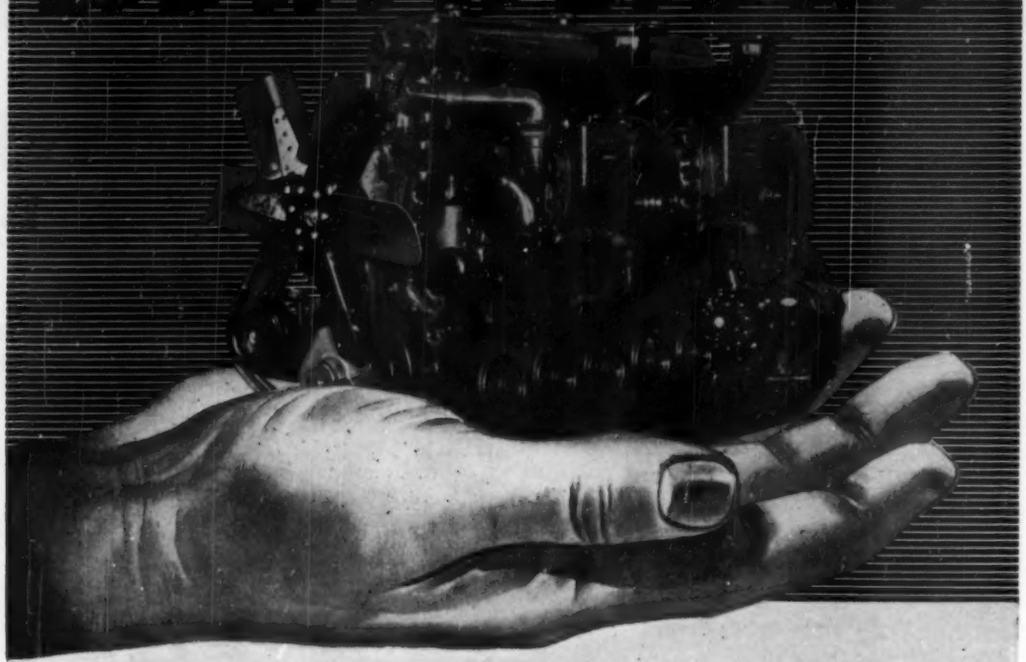
LIGHTWEIGHT



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(2 CYCLE)

Now, for the first time, a line of diesel engines in which *all* major castings are of lightweight alloys. This is what you have waited for . . . *less weight per horsepower,* rugged design for the toughest jobs . . . proved performance. And longer life, too! Write for literature. Diesel Division, Harnischfeger Corp., Port Washington, Wis.

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ELKHORN-WISCONSIN

BY: A.J.WOLFF*

THE purchase of a duafuel diesel engine by the Elkhorn Light & Water Comm. of the City of Elkhorn, Elkhorn, Wisconsin, in 1948, was an innovation in the municipal power field. To some it may seem unusual to use natural gas as the main fuel supply with the source hundreds of miles away. Wisconsin is not generally looked upon as a field for diesel engines of the larger sizes arranged for gas burning, yet here at Elkhorn is evidence that an engine of this type has definite advantages. It is believed that this is the only gas burning diesel in service in Wisconsin.

When the power plant building was originally constructed it was the intention to install diesel generating equipment, but this plan failed to materialize. At that time the city maintained a distributing system but purchased its power requirements from a utility system. Until the present diesel was installed, the building housed the distributing switchboard, two motor driven pumps of the city water system, a single cylinder 50-hp. Fairbanks-Morse variable speed diesel belted to a centrifugal pump which served as stand-by, a work shop and garage space. In 1940, a plan was again considered to install three 900-hp. diesels to take over the entire city load, but this also was never carried through.

When natural gas became available in Elkhorn, consideration was given to the installation of a diesel that not only would burn this low cost fuel but would also burn oil fuel should there be times when gas was not available. This led to the purchase of a Nordberg Duafuel engine in March, 1948. This Nordberg engine is a 4-cycle, 6-cylinder supercharged unit with a 16-inch bore and 22-inch stroke and drives an 875-kw. 2400/4160-volt, 3-phase, 60-cycle Elliott generator with 15-kw. v-belt driven exciter. Being of the duafuel type it operates as a diesel on either gas or oil fuels, the change from one to the other can be made instantly by rotating the control wheel at the end of the engine. Normally the engine burns gas but the contract with the gas company is such that during periods of extreme cold weather when there is a shortage of gas it may be necessary to switch the engine to oil fuel. The plant is given about an hour notice when a changeover is required. During the winter of 1949-1950 the total time that the engine was off the gas line was only 20 hours, the longest single period being 6 hours.

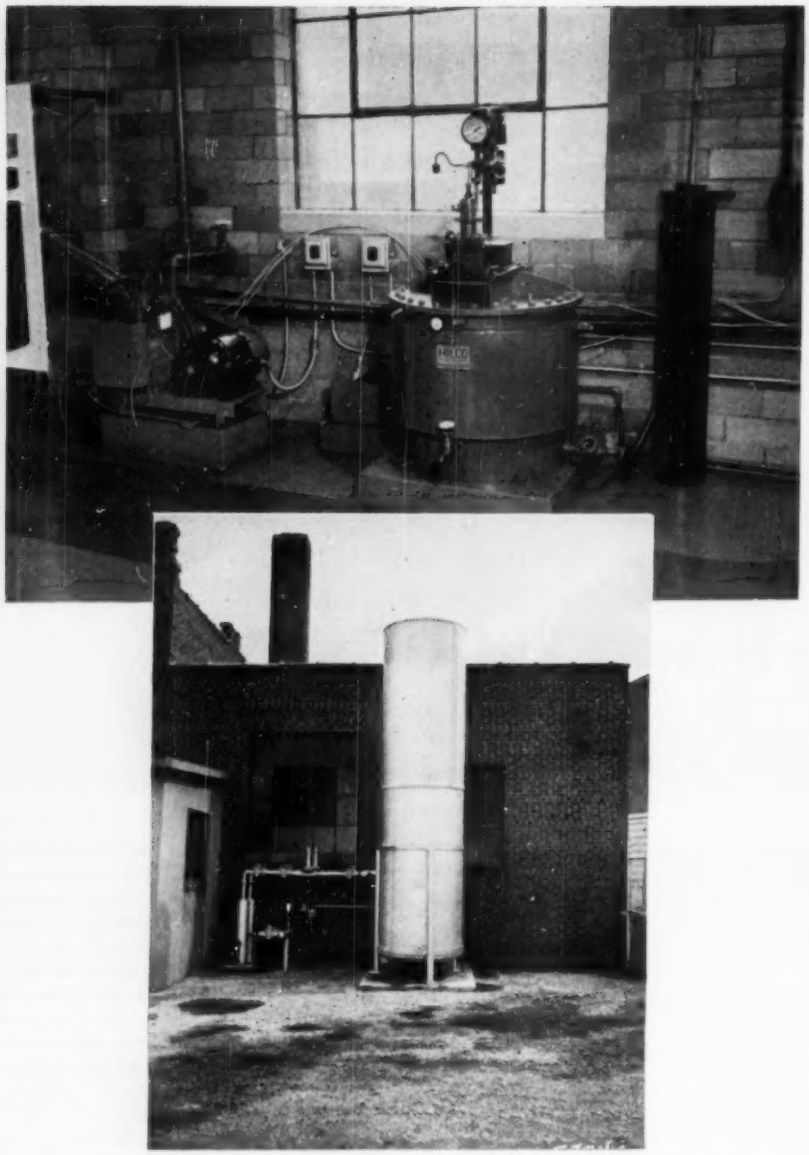
Shortly after the engine was purchased there was a change in the supervision of the plant, and when the present superintendent took over, the generator had been delivered and was setting outside the plant, while the engine stood on a railroad siding waiting to be unloaded. Some work had been started on the foundation. There had been no complete plant layout made, no auxiliaries had been ordered; in fact, the whole project was at a standstill. After gathering all the loose ends and overcoming difficulties and delays in securing materials and services, the installation was finally completed and the engine placed in service late in July, 1949.

Since the engine did not have sufficient capacity to carry the entire city load, it was intended to operate it in parallel with the Wisconsin Gas and Electric Company system. This would accomplish two purposes: One, it would smooth out the peaks of the city service, thereby lowering the demand charge and reducing the over-all rate of purchased power. Two, it would smooth out the peaks of the city service, thereby lowering the demand charge and reducing the over-all rate of purchased power. Too, it would provide some stand-by service in case of a failure of high line service. The engine is held at practically full load capacity with unit power factor from 7 a.m. to 10 p.m. six days a week. During this period only the demand in excess of the load carried on the engine is supplied by the utility system which also carries all the city load when the engine is not in service.

Table 1 for the first four months of 1950 shows the comparative costs of gas burning diesel generated power with purchased power. Since the engine operates on constant load, there is little difference from month to month of the various expense items that enter into the cost of generation.

The figures show that the engine is delivering a kw. hour one 9.77 cubic feet of natural gas and has a lube oil consumption of 4,301 kw. hours per gallon. Including cost items of gas, pilot and fuel oil, lube oil, labor and maintenance, the kw. hour cost is .603 cents as compared with 1.25 cents for purchased power. During this period, the only expense for maintenance was the renewal of filter elements of the oil purifier and which are replaced periodically. During these four months, the engine operated for a total of 1,537 hours, which with the 1,354,922 kw. hours generated shows the engine

Superintendent, Power Plant at Elkhorn.



Above: Hilco oil purifier and Gardner-Denver starting air compressor inside plant. Below: Outside installation of gas regulators and surge tank.

was carrying an average load of 881 kw. This means that the engine was slightly beyond its full load rating of 875 kw.

For the month of March it will be noted that the amount of pilot and fuel oil was much higher than for either of the other three months. This was occasioned by cold weather when the engine had to go from gas to oil fuel on several instances.

The plant is favorably located adjacent to the main of the Wisconsin Southern Gas Company. A 4-inch line carrying gas at 50-55 lbs. pressure goes to the gas company's regulators, where the pressure is reduced to about 14 lbs. After passing through two American Gas meters arranged in parallel, the gas is again piped outside the building to a scrubber which also serves as a combined reservoir and surge tank.

Oil used for pilot fuel and for regular operation when gas is not available is delivered by tank car to a siding which runs through the rear of the plant property. There are two storage tanks having capacities of 15,300 and 27,500 gallons with unloading facilities consisting of a Viking Type ZL transfer pump driven by a 3-hp. master motor.

Oil from the storage tanks flows by gravity through a Trident filter, a Trident meter and then to the built-in fuel transfer pump on the engine which delivers oil to the fuel header. There is also an overhead day tank of 300 gallons capacity to which fuel can be transferred by a Roper 26F3, 3-gpm., 40-psi. head pump driven by a ¼-hp. General Electric motor and which is located in the pit adjacent to the engine.

With the small amount of oil fuel used as pilot fuel when the engine is burning gas and since the engine burns oil only on rare occasions during winter, it has been found advisable to use a quality fuel oil. For this purpose, Lockwood's lubricated diesel oil, a clear, light weight oil, is being used. While the cost is but little more than fuels normally used for an engine of this type, the advantages more than outweigh any difference in cost, especially since so little oil fuel is used. The higher cost would have little effect on the overall cost of power generation.

TABLE I

Month Eng. Hrs.	K.W. Hr. Generated	Gas Cu. Ft.	Cost of Gas	Pilot Fuel Oil, Gals.	Fuel Oil Cost	Lube Oil, Gal.	Lube Oil Cost	Labor	Maintenance	K.W. Hrs. Purchased	Cost of Purch. Power	Month Eng. Hrs.
Jan.–363	325,940	3,214,000	$1,392.40	772	$ 84.92	72	$ 38.88	410.00		429,600	$ 5,370.00	Jan.–363
Feb.–391	344,600	3,465,000	1,463.70	903	99.33	72	38.88	410.00	$40.00	439,200	5,270.40	Feb.–391
Mar.–392	345,442	3,207,000	1,390.30	2,751	302.61	91	49.14	410.00		360,000	4,608.00	Mar.–392
Apr.–391	328,940	3,375,000	1,394.80	929	102.19	80	43.20	$ 410.00		355,200	4,511.03	Apr.–391
1537	1,354,922	13,261,000	$5,741.20	5,355	$589.05	315	$170.10	$1,640.00	$40.00	1,584,000	$19,759.44	1,537

The cylinders are lubricated by a 12 feed Manzel force feed lubricator mounted at the control end of the engine. Bearings and other details requiring lubrication are cared for by the circulating pressure system and supplied from a built-in gear driven pump located on the operating side of the engine adjacent to the flywheel. Oil from the various parts lubricated returns to the sump in the bedplate. The pump takes its suction from the sump and forces the oil through a Nordberg duplex strainer, then the Ross 1206-CP lube oil cooler having a capacity of 550,000 btu. per hour and then to the lube oil header on the engine for recirculation. A Hilco purifier operates continuously, taking oil from the sump and after being purified, the oil is again returned to the sump supply. This purifier has a capacity of about two gallons per minute.

There is also an auxiliary lube oil pump to serve as an emergency should there be a failure of the built-in pump and is also used as a before and after lubricating pump. This is a Roper Fig. 26F150 rotary pump having 130-gpm. capacity at 50 psi. and driven by a 10-hp. G. E. motor.

One noticeable advantage in the use of gas fuel is the lack of contamination and the long life of the lubricating oil. After the engine had seen 2,175 hours of operation, a sample of the oil, which is Ursa P-30, was sent back to The Texas Company for analysis. It was found that there had been no change in the oil since the engine was placed in service other than a minor difference in viscosity which could readily be remedied. With the method used for purification it is believed that the oil will last indefinitely. Over a four-month operating period, the engine showed a lube oil consumption of 4,301 kw. hours per gallon.

While this good showing in lube oil consumption has a definite bearing on kw. hours production cost, it has a further advantage that cannot be so readily noted. This is the minimizing of wear to bearings and working parts attributed to clean oil. Lessened wear means lower maintenance expense and longer engine life.

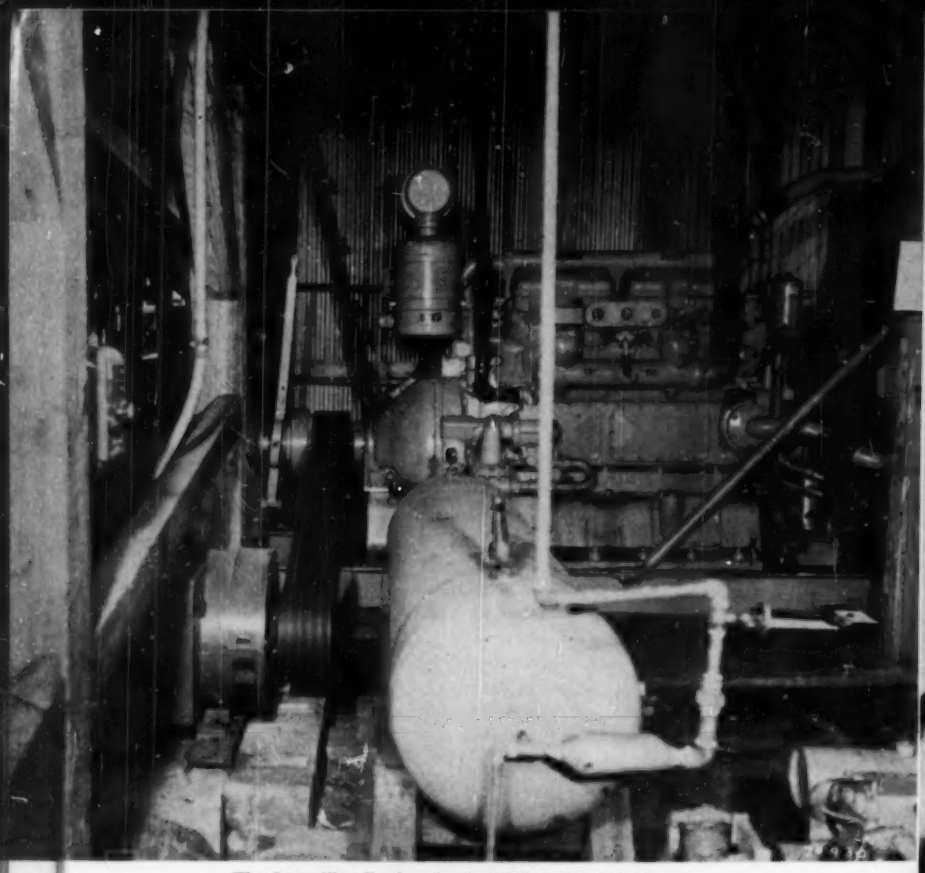
Water for Elkhorn is obtained from deep wells, which are also the source of cooling water supply for the engine. Raw water is taken from one of the wells and is discharged into 275-gallon tank located just above the floor and back of the engine. At the outlet of this tank is a Y connector, one branch going to the lube oil cooler, the other to the Allis-Chalmers electrifugal raw water pump of 300-gpm. capacity at 90-foot head and driven by a 15-hp. motor. This pump discharges through a Ross 1006-CP heat exchanger which has a capacity of 1,710,000 btu. per hour. After passing through the heat exchanger, the water is carried to an old well and returned to the ground supply.

All city water is treated and consequently soft water is available for the engine jackets. This water is circulated by an Allis-Chalmers electrifugal pump of 300-gpm. capacity at 70-foot head and driven by a 10-hp. motor. In this circuit is an overhead surge tank of 50 gallons capacity.

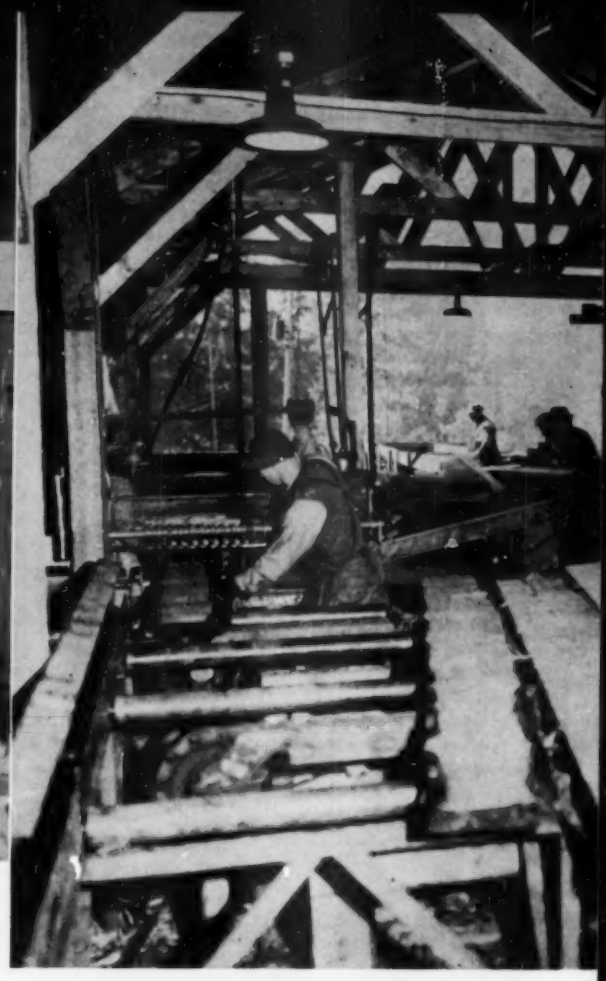
The plant at Elkhorn is exceptionally quiet in operation due to effective silencing. A concrete structure houses the American Type 5-och. air filter on the suction line, while a Burgess-Manning Type STL-16 snubber quiets the exhaust. On the exhaust line is a Zallea flexible connector to care for expansion. A panel on the operating end of the engine has the push button controls for the auxiliaries, and a Viking alarm for lube oil and jacket water pressures and temperatures. This alarm functions should the oil or water pressure drop below 15 psi. and the temperature of either rise above 150°F. Air for starting is supplied by a 11CFM, 250-psi. Gardner-Denver air compressor with 5-hp. motor.

While the diesel engine generates less than half of the city's requirements, the savings being made definitely prove that the installation is a good investment and that greater savings would be possible if the entire city load could be carried by diesel engines. As changes and improvements are being made, all are a part of a long range plan of a future expansion program of the city's utilities.

Nordberg Duafuel diesel engine installed at Elkhorn, Wisconsin.



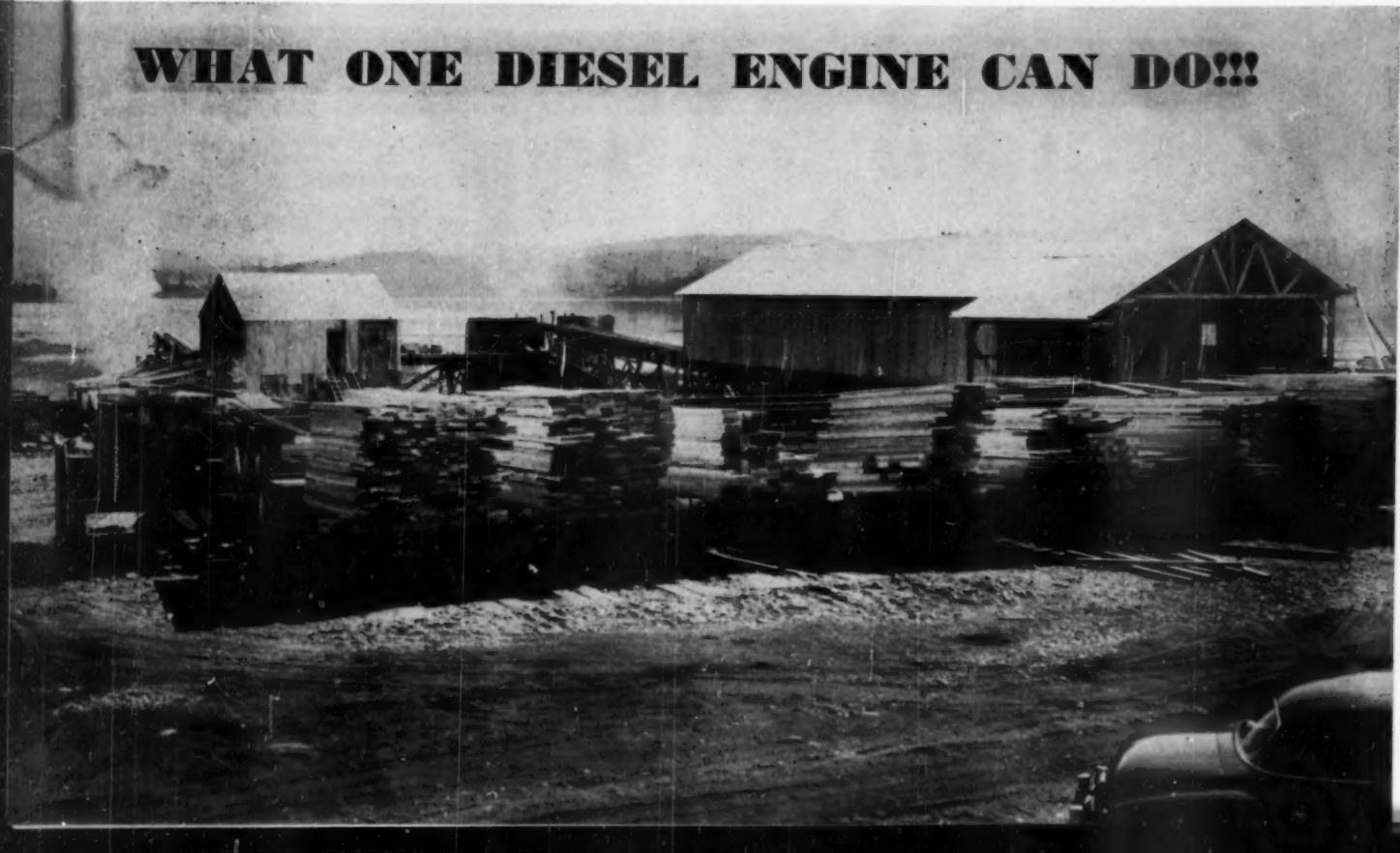
The Caterpillar diesel engine installed at the Rudy Bros. Logging Company near Castle Rock, Wash. This is an 8-cylinder V-type unit.



The adaptability and availability of a diesel engine in the rugged requirements of a lumber and saw mill off the beaten path near Castle Rock, Washington, is well illustrated on these two pages.

These illustrations show what one diesel engine can do in the production of 40,000 board feet of lumber per day in the State of Washington.

WHAT ONE DIESEL ENGINE CAN DO!!!

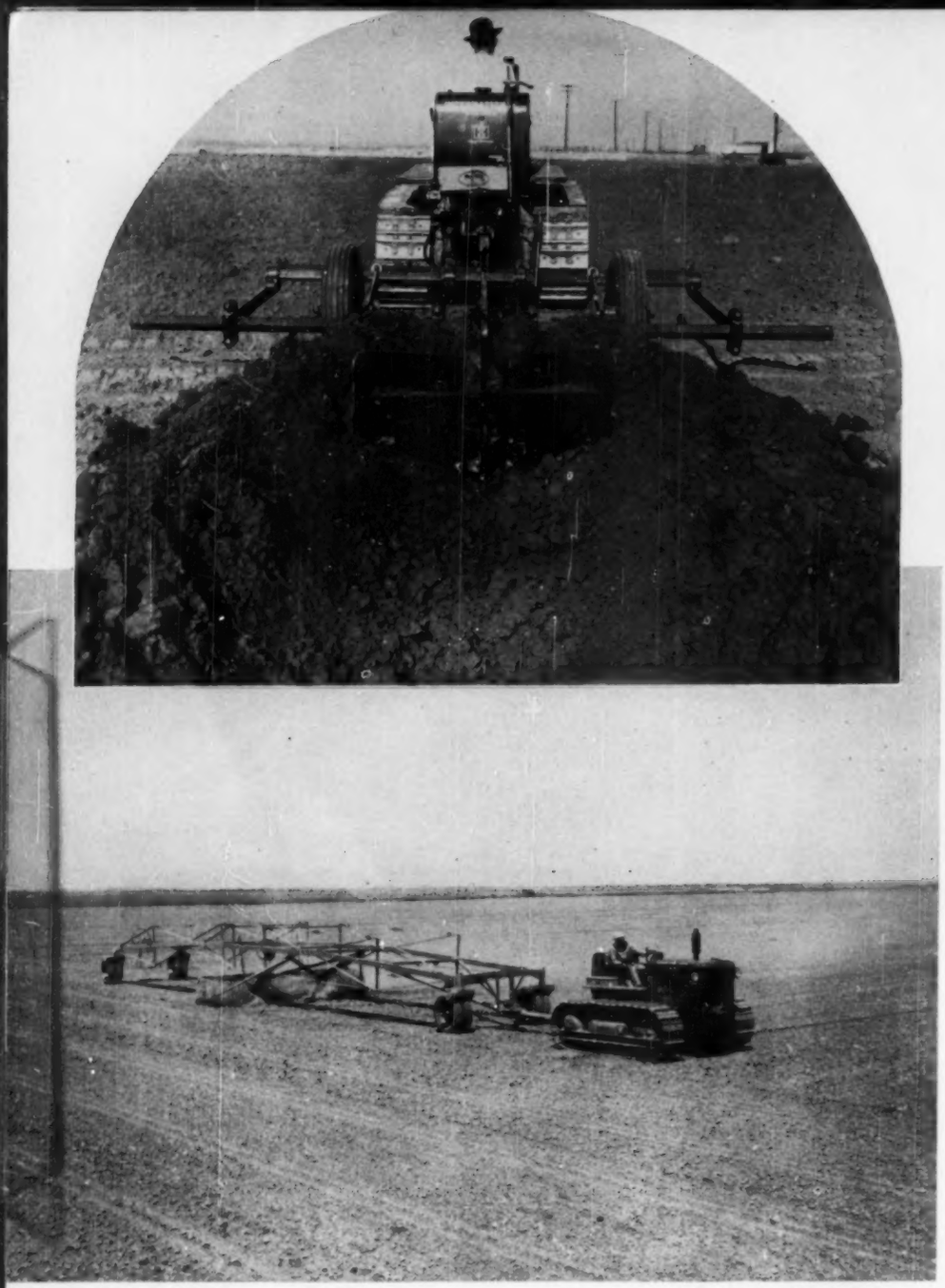


THE first new Caterpillar V-series engine, the D375, to go into a Pacific Northwest sawmill, is producing 40,000 board feet of fir and cedar lumber a day at Rudy Bros. Logging Company near Castle Rock, Washington.

Partner-manager Julian Rudy (in illustration at right) rebuilt a modern new mill with the engineering help of Lionel Pease on the Silver Lake site of a recent devastating fire that leveled off an old mill and an adjacent shingle mill.

The new engine powers every phase of the Rudy Bros. operation. An air-starting motor eliminates the need for gasoline. The 5¾x8-inch 8-cylinder diesel is radiator-fan cooled, has a blower and air-intake silencer. It is mounted on an extended base with outboard bearings and an enclosed clutch, and has an external oil filter system which permits 1,500-hour oil change periods.

The main shaft runs a 15-inch flat belt to the line shaft on the head rig, a 10-inch flat belt to the edger and is V-belted to a 60-kw. E & M generator which operates the following electric motors: 7½-hp. motor to operate log lift; 3-hp. to operate main transfer from roll case to edger; 2-hp. to operate transfer from rear edger table to trim saw; 7½-hp. to 2-saw Hula trimmer; 7½-hp. timber and slab saw; 5-hp. green chain; 5-hp. to operate 20 cu. ft. air compressor for starting motor, air kickers, air lifts, etc. The Rudy mill regularly employs fifteen men and lumber goes to its Longview mill for re-saw.



Above — Diesel-powered irrigation ditch being made through field for water for the cotton crop with an International TD9 tractor.

International TD14 pulling Marvin Landplane as it puts the table-level finish on a field to make water, labor, seed and fertilizer go farther.

ON THE LEVEL WITH DIESELS

Irrigation Brought to Eleven Western States a Guaranteed Farm Crop That Has Slowly Developed Special Land Shaping Equipment to Plow Back Hundreds of Millions for Long Term Dividends.

By F. HAL HIGGINS

IRRIGATED farming as developed in the U. S. West has eliminated the hazard of drought and brought guaranteed prosperity to the individual farmer, his community, state and nation. Yet as late as the '70's there were farm editors arguing that deep plowing rather than the expensive irrigation projects being promoted at that time was the answer to California farming. Today California is producing nearly one-half the agricultural crop values of the eleven western states because of its leadership in irrigated farming. Two-thirds of California's farm income is from irrigated land with Arizona's percentage equally high. And through the whole West, on over in to the level lands of Kansas and Nebraska, the idea that irrigated land guarantees prosperity in farming with no crop failures has caught on to the point that wherever there is water running off in rivers, irrigation projects are being talked. Knowing that this trend to irrigated farming has called for tremendous investments in the future in "banking" in their own farms the profits from past crops and frequently the mortgaging of the future in developing the early irrigation districts, the writer has been trying to get the facts on just how much the western farmer has invested in his land in levelling it by the power of the big diesel crawler tractors to change it from dry land to irrigated land at a cost of $50.00 to $100.00 an acre. No statistics can be found in U. S., state or local archives as to how many hundred millions of dollars the trend represents in the last decade or two. Certainly the movement was greatly accelerated during the war as the Government called for all-out production of foods with very profitable prices and allowance of deductions for such soil conservation as levelling farm lands gave. Various estimates of $100,000,000 to a half billion dollars have been heard. Dealers in tractors, scrapers, landplanes and gasoline have answered with guesses on some areas. We know that prices for land levelling have gone up to about double what they were before the war, jumping from about $40.00 and $50.00 an acre to $80.00 to $100.00, depending on terrain and tree coverage.

Just to give you an idea of what irrigation means to the West and how well both Government and Agriculture are sold on it to bring certain prosperity to all, read these three paragraphs from Prof. H. B. Walker's talk to the farm machinery industry at the annual University of California Farm Machinery Conference: "In these Western States approximately one-half of the cash farm income is produced on irrigated land. For California and Arizona nearly two-thirds of the cash income is from irrigated land. The irrigated area in the eleven Western States has more than doubled since 1900, and this land now represents 35 per cent of the crop productive capacity of the area even though in actual area it takes up only 2½ per cent of the total land surface. This great irrigated area with its 18½ million acres of watered land provides about one-third of the crop land and approximately one-half of the total cash farm income of the region. The range lands provide, in addition, great opportunities for livestock projects, and neither should we overlook the potentialities of the regions' dry land farming areas. However, the great agricultural potentialities of the west are intimately related to irrigation development. Agri-

(Top picture)—Diesel teamwork will give San Joaquin Valley a big drink from the Sacramento River! A big Cooper-Bessemer diesel-powered dragline cutting a canal through the low hills 8 miles northwest of Tracey for the irrigation canal that will carry excess Sacramento River water to the San Joaquin Valley by means of a giant pump two miles farther north. The pump is a Worthington. (Bottom picture)—Fleet of Cat diesel tractors pulling LeTourneau scrapers levelling a new cotton field for irrigation just east of the San Joaquin River a few miles from Los Banos, Calif.

"Stan" Mooze's headquarters was the busiest spot in California for a few months when drought started a stampede for diesel engines to pump the precious water onto parched lands. Stan is distributor for GM diesels for a big section of California.

cultural production in this region has more than doubled since 1910 with the increase in California nearly twice as rapid as for the rest of the area. In the period 1939-43 the cash farm income in California was 83 per cent of the other 10 states making up the Western farm group, nor has California or the other Western states reached the limit of irrigation development. The Bureau of Reclamation has submitted to Congress a development program for the irrigation of 6¾ million acres of new land plus supplemental supply of water to 9½ million acres as an estimate of maximum possible development within ten to twelve years. This is, of course, higher than may be reasonably achieved in so short a time, but Clawson and Calhoun state in their 'Long-term Outlook for Western Agriculture': 'Considering all factors, it is estimated that irrigation of new land and provision of supplementary water supply will be equal in productivity to about four million acres of irrigated land by 1960.'"

Irrigation in California farming began trickling from the mining flumes as the Gold Rush slowed down with the end of easy pickings for the swarms of gold hunters. The weather and economic hazards of farming so far from the world's markets made it one of the most unstable gambles in the field of human endeavor. Floods, droughts, wild geese, north winds, slow and costly transportation of crops, high money interest rates and alternate gluts and shortages of crops kept the western farmer eternally behind the eight-ball economically, it seemed. The best crop land was in the valleys and most of it was still to be reclaimed. As wheat farming reached its climax in the early '80's, world markets sagged and wheat farmers went broke in droves. It was time for safe, sure irrigation on a big scale instead of merely a trickle for gardens. An editorial voice was lifted in a long loud call for irrigation on a scale that called for millions of dollars for big canals to bring Sacramento River water out of the river and onto the rich valley lands. This was from the fighting editor, Will Green, of Colusa, who today is known as the "Father of California Irrigation."

Some of the big ranchers like Miller & Lux, in the San Joaquin Valley West Side, spent thousands of dollars in building irrigation canals and dams to insure hay for their beef cattle. It was slow, expensive work done with slip scrapers pulled by mules and held and dumped by sweating, bending men working in clouds of dust. Out of these early efforts at land levelling and canal building for California's irrigated farming system came a series of cost-cutting, labor-saving tools that gradually added more and more irrigated farming lands. It proved the preachers of irrigation right as California farming moved into prosperity with less and less hazards of weather and "acts of God," such as weeds, bugs and wild game.

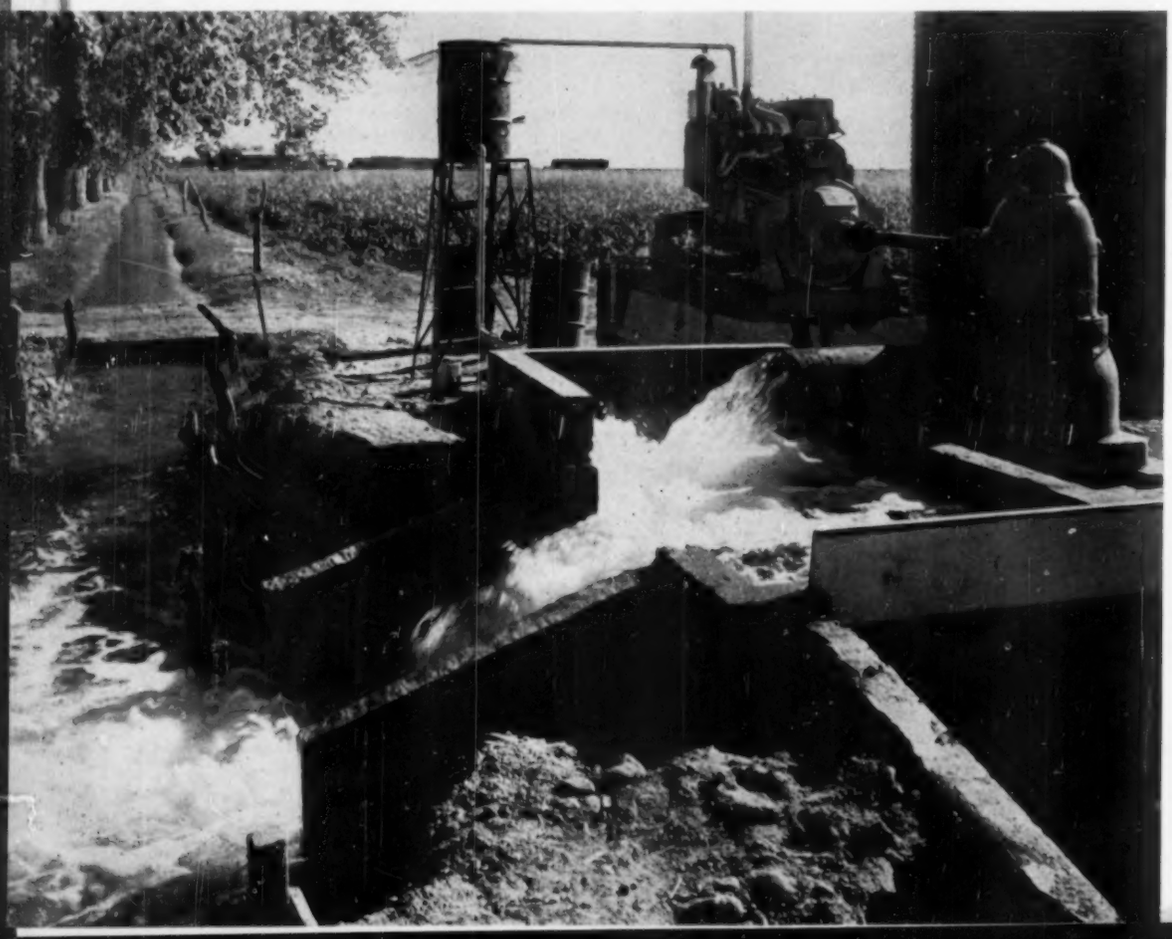
"Bill" Patterson, a canny Scot with both Old Country mechanical fundamentals and American experience, arrived in California in the early '70's and immediately caught the spirit of the state and the times as he worked around gold mines, Fresno town layout and irrigation developments before going to Stockton to be superintendent in one of

the leading foundries and machine shops turning out combined harvesters, plows, reclamation and farming machines, etc. Patterson took a look at the little half-yard slip scrapers and tried dumping them a few times before taking a little stick and wiring it into place to prevent the dumped scraper from going clear over when laboriously dumped in a back-breaking, dirt-eating stoop-and-hand flip. He tipped the blacksmith on the job to what he had done to make a tough job easier and faster. That smith was none other than another canny Scot named Porteous. He was just smart enough to get a patent on the idea to launch the world-sweeping "Fresno scraper" that carried the little town's name wherever dirt moving was done in road, dam, irrigation canal, and levee building. It was still a mule-and-man-power job but a big step forward in mechanizing dirt moving at cut costs.

By 1874, special equipment aimed at speeding up and lowering cost in land levelling and ditch making for irrigated farming were beginning to get attention from inventors as well as local mechanics in the various areas where needed. The front page of the *Pacific Rural Press* for May 16, 1874, featured Read's "Patent Road Scraper," adapted to all kinds of scraping "and especially for levelling off land so as to allow for an equal flow of water for irrigation purposes." The item reported that Gen. Bidwell, the bonanza farmer of the Chico area of the upper Sacramento valley, was the first to adopt the use of this new land leveller. W. L. Overhizer, extensive farmer and prominent Granger of Stockton, had secured the right to sell the new machine for San Joaquin County in order to speed irrigation ditch construction as well as roads. Scott, Watkins and McCall, of Santa Clara County, Calif., were given a patent on the McCall scraper and levelling machine to introduce to road scrapers the "push-and-pivot with semi-circle and turn table, or swinging frame." Scott & Watkins was a famous California "Agricultural Works" of the time, turning out threshing machines, steam engines, and any other machines and implements demanded by the farmers, contractors and freighters of this bustling area. The McCall patent was sold to George W. Taft, of Conecticut, and by 1882 he was battling Pennock Co., another leading eastern road machinery builder, over the infringement of the McCall patent.

By 1909, the *Pacific Rural Press* carried advertisements for the Imperial Land Grader, built at Sacramento and "the only grader and scraper combined that moves earth and levels the ground perfectly and with ease." The Fresno scraper advertisement in same issue looked obsolete. With irrigation projects pressing all up and down the San Joaquin, Sacramento, Santa Clara and smaller farming valleys, every blacksmith shop was turning out some irrigation equipment in which more dirt per man could be moved in a day. Over at Stockton, Holt Brothers, wheel and hardware importers and wholesalers, turned to building freighting wagons, land levellers, combined harvesters and steam tractors as farmer demand kept pressing. As more mule power was added for bigger scrapers and faster work in dirt moving, the arrival of steam tractors was inevitable. By 1888-1890, Holt at Stockton, Best at San Leandro, Heald at Vallejo, Price at San Leandro, Baker & Hamilton at Benicia and a few lesser manufacturers were building steam tractors for powering freight trains, logging, farming and mining projects. They immediately hitched onto the land levellers and ditchers to speed up and cut costs of irrigation. Holt led in this special land levelling equipment in the '90's and up into the 1900's. Over at Davis, a rugged ex-Holt engineer named "Ted" Schmeiser began building bigger, better and easier handled land levellers to step out in front in the trend to lowering costs and speeding irrigation projects. By 1914, Schmeiser was putting an air tank on his land scraper-leveller to permit one man to easily handle the machine as it was pulled by the big Holt and Best crawler tractors that were coming onto the scene to revolutionize heavy duty tractors for off-the-road work. First Holt, then Best and Yuba, all of California manufacture and development, began building tracktype tractors, as steam power changed to gasoline. Down went costs of land levelling and canal building to speed up irrigation and shift the economy of Agriculture and the State. Old time dirt moving equipment men say they can look back forty to fifty years and see clearly how the cost of moving a yard of dirt came down from $1.00 to 80 cents; then to 50 cents, and 30 cents, 20, 15, and finally, just before World War I, they say diesel-powered jobs went as low as 4 cents a yard!

Scarcely fifteen years ago, Marvin, at Knights Landing, built his first landplane for a rice grower to smooth the fields like a giant plane for economy of water, seed, fertilizer and time. It was a hit from the start, and now every California rice, grain, cotton, bean, beet and flax grower owns and uses such a tool behind his diesel tractors as standard irrigated farming equipment.



Cat diesel engine—D13000—driving Kimball-Drogh 14-in. irrigation pump in Arizona, where the irrigation influence on agriculture is just as strong as it is in California. This water is going out on alfalfa and maize fields.

RE-POWERED TUG "CONFEDERATE"

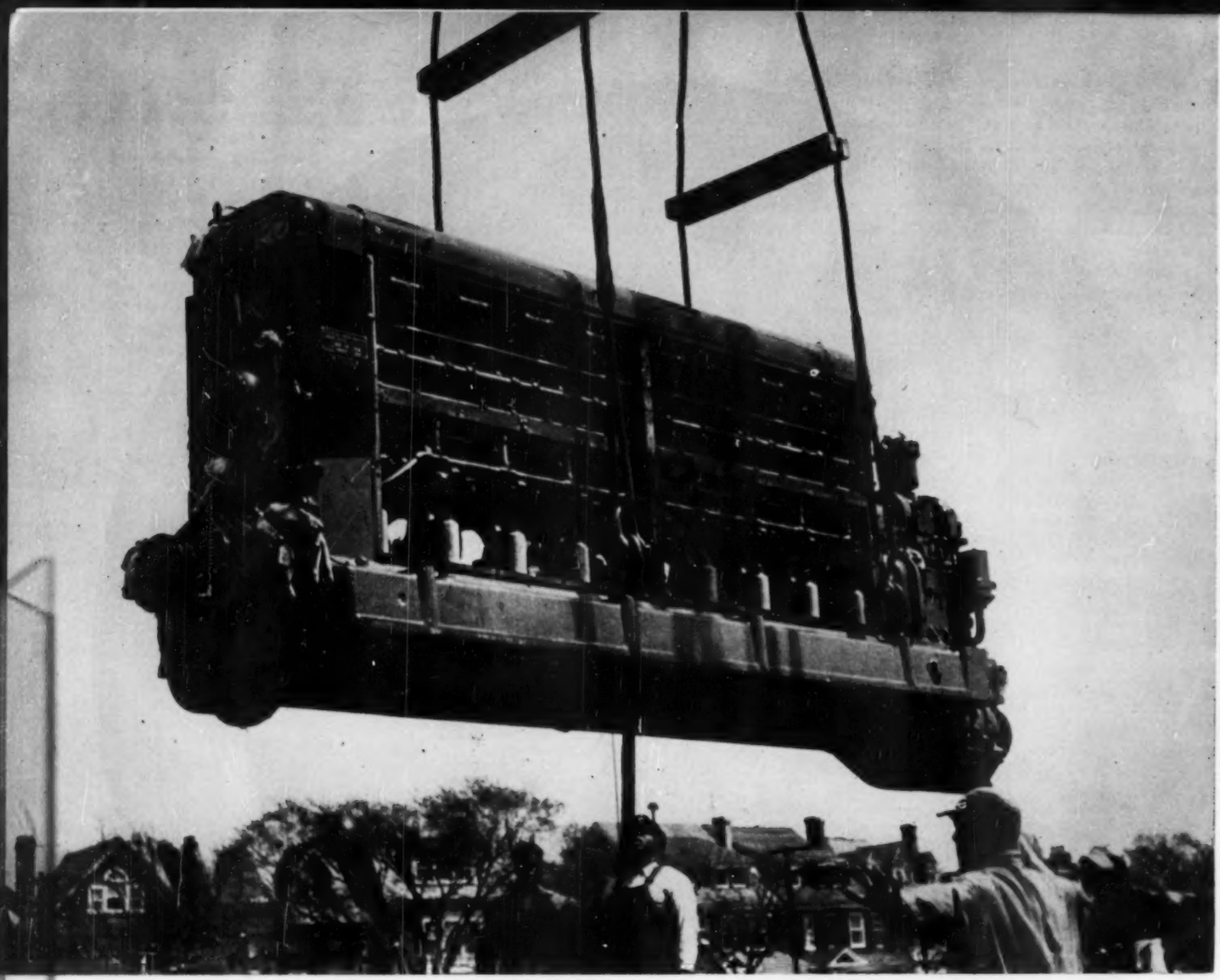
By DOUGLAS SHEARING

EARLY this year, Lynch Brothers, Norfolk, Va., towing operators, came to the conclusion that their 60-ft. 23-year-old tug *Confederate* was falling down on her job of towing fully loaded oil barges on the fast-flowing James River between Norfolk and Richmond, Va. Still sound of hull and structure, *Confederate* obviously required a new propulsion engine to replace the old power plant installed at the time the boat was built.

Performance and installation demands interposed were somewhat unusual as compared with an average repowering project. (1) Before purchasing a new engine, Lynch Brothers wanted to be as certain as possible that the engine selected would increase boat-speed, operating efficiency and economy to repay its cost in a reasonable time. (2) They wanted the engine to be no greater in overall base dimensions than the old engine, so it could fit the existing engine bed on the *Confederate*, without bed alteration or change. (3) The engine had to assure a boat performance policy laid down years ago by the late Edward H. Lynch, founder of the company and long-time towing operator of Philadelphia and Norfolk.

In their highly successful operations, Lynch Brothers have never deviated from the success-formula laid down by their late father: No crew lay-offs between jobs, no limit on galley bills, handle the boats yourself (the Lynch Brothers, Clay and Edward, do—in the tricky waterways of the Chesapeake and Carolinas). Further, and most important in relation to the new engine problem, Lynch senior had insisted that every tug in his fleet be able to out-tow, out-manoeuver and out-perform any competitive boat in the same working waters. This operating policy has endeared the Lynch brothers to their tug crews; earned for them the respect of both competitors and customers.

The new engine had to possess the power to cope with the rapid current when the river was in spring flood stage.

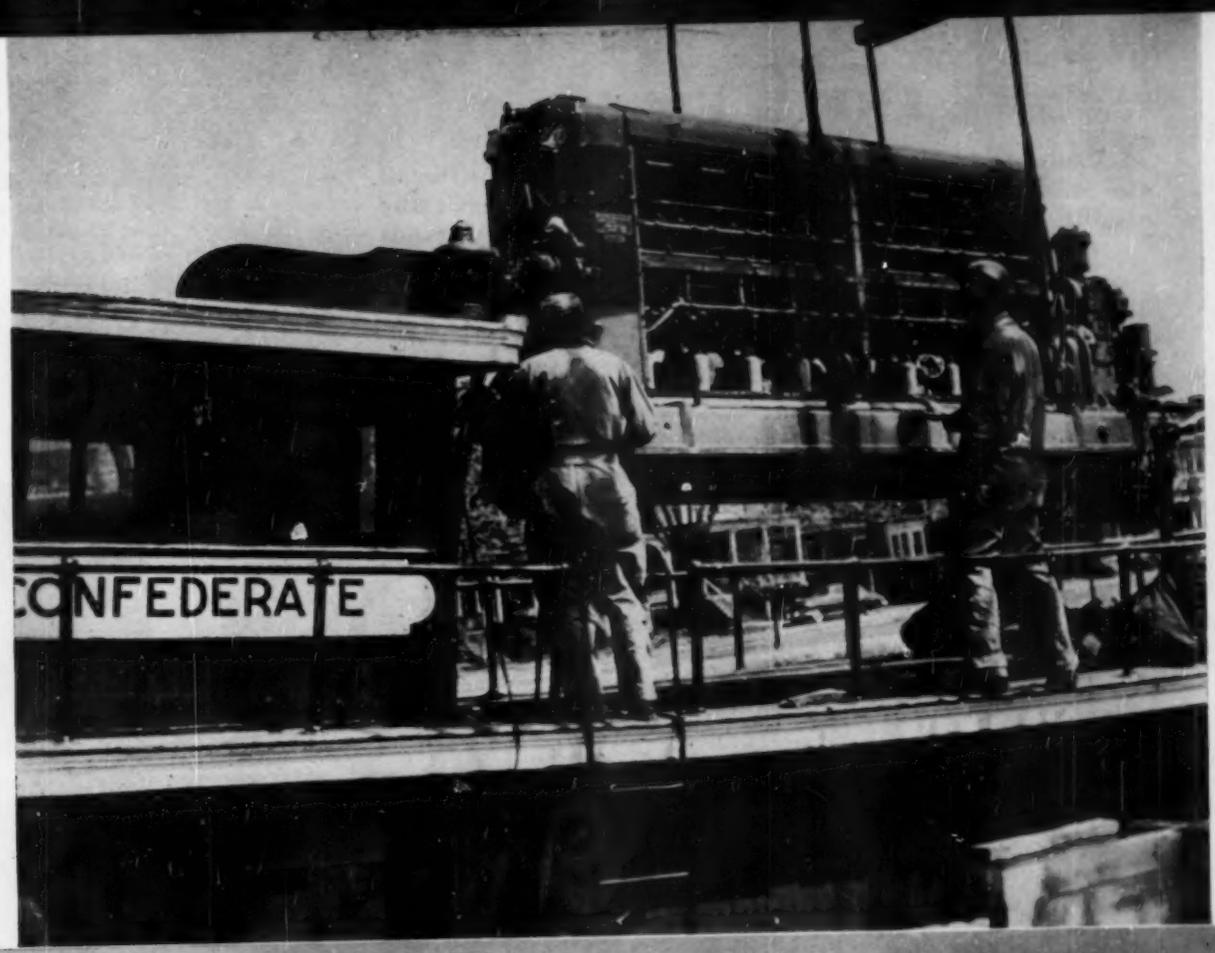


The Lynch Brothers turned to their customary source of guidance in all maters where important marine engineering is concerned. As their father had done for many years before them, they took their problem to George Curtis, Jr., president of Curtis Marine Co., Inc., Norfolk, Va., distributor of Lister-Blackstone engines for this territory. Mr. Curtis recommended that a Lister-Blackstone main propulsion engine be chosen, pointing as evidence to the fine performance of a Lister-Blackstone auxiliary diesel 8-hp. that his company had installed on the *Confederate* several years previously and which was giving eminently successful performance driving the *Confederate's* generator, bilge pump and compressor. Mr. Curtis' specific recommendation for the *Confederate's* new engine was an 8-cylinder Lister-Blackstone rated at 320 bhp. at 600 rpm.

Before coming to a decision the Lynch Brothers closely surveyed prices, curves and specifications on a number of makes of engines. The comparison between *Confederate's* old engine and her new Lister-Blackstone purchased on Mr. Curtis' recommendation, was an interesting one. The old engine, developing 280 hp., turned a 58x32-inch 3-blade propeller at 340 rpm. and gave the boat a maximum speed under full tow load of 5½ mph.

For greater efficiency, Lister-Blackstone's engineers recommended a new 4-blade Columbian wheel 60 inches in diameter by 50-inch pitch, to match the greater 320 bhp. output of the new engine. Installation was handled with the skill and knowledge which characterized all such jobs performed by George Curtis' organization and took about two weeks. Exhaustive dock trials were scheduled before sea trials would begin. From an immediate, cold start at dockside the engine ran sweetly and displayed a degree of flexibility and responsiveness immediately gratifying to Clay and Edward Lynch. There was not the faintest smudge of color from the exhaust as it came up *Confederate's* stack. As engine speeds were checked, along with all connections and pressure gauges, the unusual fact came to light that amongst all sources of water, oil, fuel oil and lube oil connections, not a single joint was leaking or required adjustment. So pleased were the Lynch Brothers with the brief dock trials that they decided to take *Confederate* out on her sea trials then and there. The river was swollen by flood conditions and there was a swift current. Under such conditions, with her old power, the *Confederate* would have had to break tow. Breasting such a current she would not have had a chance in an endeavor to shove her tow up-river. Running free, up stream and down over a measured mile, *Confederate* averaged just over 11 knots—an improvement of better than 50 per cent over her speed under her old engine. Unusual lightness, flexibility, expressiveness of her controls, brought her from full-ahead to full stop to full-reverse in only slightly more than her boat-length and in a matter of seconds. Customer acceptance was made then and there—an unusual procedure after only one day's dock and sea trials.

The next day came the real pay-off, the moment that the Lynches were waiting for. Under full load of two barges of oil *Confederate* showed a speed 20 per cent greater than she did with her old engine. This added speed makes possible an additional round-trip run every week, representing pure "gravy" from an operating-profit standpoint.


CONFEDERATE

"BY THEIR FRUITS--"

The Diesels Have Lifted Orchard and Grove Crops Out of the Marginal Farming Field by Cutting Costs, Increasing Quality and Giving Management More Powerful Tools

By F. HAL HIGGINS

Here is an International TD14 powering subsoiler for breaking up heavy dry irrigated soil to allow penetration of water and air as well as roots of fruit or nut trees to be planted in a new orchard. Before tractors, it took a string of horses and mules to get any real sub-soil work done. Imagine 52 horses and mules hitched to this tool to do as much work and you get a slight idea of what the modern orchard tractor means in doing this work for higher quality production of fruit.

WESTERN fruits and nuts have had to overcome the handicaps of distance from consuming market from the outset of modern production. But today, after from a half century to 75 years of up-hill effort, this specialized farming system as perfected in California, Arizona, Washington, Oregon is Big Business that operates efficiently and profitably for individual farmers and members of co-operative associations for fruits in the producing areas. In California the irrigated fruit industry goes way back to the '80's for oranges, English walnuts and raisins, as these crops started to go east as commercial crops aimed especially at the Christmas and other holiday periods. Every farm and small town kid in the Mid-West learned to look for a big yellow orange, raisins dried in bunches, and some English walnuts in his stocking on Christmas morning. The last day of school also brought some such colorful treat to the students in the prosperous farming areas. Outside the cities where oranges could be seen on the stands through more months of the year, this fruit was a special holiday treat for those who could afford to spend five cents for one. The citrus industry was blessed with a lot of business heads who had retired from successful industries, banks, law offices, etc., for reasons of health or arrival at a stage in income where they were independent. Hence, the growers got together and worked out problems of marketing, pest control, water, packing, etc. They knew they had to market a superior product at a long distance from home to build a market that would demand their fruit above the foreign product and in preference to cheaper local fruits of other kinds. This they did successfully long before Florida, Texas and Latin America citrus rose to battle for the same U. S. markets.

Irrigation of orchards and groves—deciduous fruits like apples and pears are grown in orchards; citrus such as oranges and grapefruit in groves; dates come in gardens—brought problems of water penetration of soils that developed hard pans roots could not penetrate. Hence, deep tillage tools in orchard cultivation around Los Angeles brought in tractors to pull the bigger sub-soilers demanded to go deep enough to break up the pan. Holt, Best, and Yuba were the crawler tractors that began going into the orchards forty years ago to increase the power without filling the orchard with horses and mules for unwieldy teams on turns. The wheel tractors of Holt and Best had begun going into the grain fields as early as 1888 following Best's start to build the Remington steam wheel tractor after it was demonstrated to ranchers, contractors, miners and loggers at the San Leandro shop of Daniel Best early that year. But these big steamers were not for the orchards. The Great Valley of the San Joaquin and Sacramento rivers was all grain without irrigation for the most part, though small areas were beginning to be irrigated by "flowing wells" in the San Joaquin Valley. So, the irrigated fruit industry outside the aristocratic citrus belt around Los Angeles had a long uphill road with plenty of sharp turns and rough spots in it.

Let "Alf" Johnson, who worked on orchard tractors from the time he got an idea his father's orchards could be worked easier by tractor than by horses and hoes about 1904, tell how the orchard tractor developed: "I started building my first experimental model in 1906," said Mr. Johnson to the writer. "It was a gas job, as I wanted to try out gas engines in tractors. They hadn't

got anywhere yet, you know, on account of all the troubles in developing spark plugs, ignition, carburetor, etc. It was a wheel job with an engine from the Samson Iron Works at Stockton, where I was working on this tractor. I tested it for about a year. As a result, I concluded to build a bigger model, which I did and sold to a man named Chadbourne, at Suisun. It was a 12-hp., 3-wheel job. The gas engine was a 2-cycle one.

"My brother and I then started the Johnson Tractor Co. at Sunnyvale in 1907. We had gone along with experiments enough to reach the conclusion that wheels were not too effective or efficient for tractors in California. Holt had reached the same conclusion over at Stockton in building steam wheel tractors for the peat lands of the Delta. Well, we built our Johnson 'Toe Hold' tractor for about two years. We found that even wheels with all these lugs and other devices to get traction were not the solution. So we sold out to the Joshua Hendy Iron Works and that firm later sold it to the Rumely Company, which was trying to break into the California tractor field. They advertised and built it in California for some time. I think we built about 50 of this Johnson tractor. Rumely paid Hendy $100,000 for it. Next we began working on tracks. We went east on development work for a time. Yuba got hold of Hennuse about 1912. It was designed and built at Detroit. Henry Ford took a look at it while there and spoke rather favorably of it. I shipped it west that winter of 1912-13 and tested it around San Jose that winter. It demonstrated well. I showed it at the California State Fair in 1913 and the Yuba people saw it and bought the rights to manufacture. Hennuse went with Yuba then. I didn't. The Bean tractor with its single track I engineered about 1914. Bean built 1,000 of them. The Japs got 500 of these, and I suppose they shot them back at us in the last war. I had almost forgotten the Paragon tracklayer I built for Hendy about 1916. It went to the State Fair. Holt was watching it there, and their threats on infringement of patents scared Hendy out of going into production. Holt was quite allergic to patent infringements at this time, as they had just been through the big case against Best in which Best reversed the field by buying up Lombard's patents and counter-suiting. Finally, at the end, Holt bought up the whole mess of Lombard and Best patents and then went around to everybody building tracks and demanded royalties. The Unitrac I built about 1926, using an Indiana motor cycle twin engine for power. It was a snappy little job."

Service Manager giving International diesel ID6 final check-over before sending out to a San Jose prune orchard.

It was in May, 1929, that your Old Reporter went up to Oregon to cooperate with Oregon State College Agricultural engineering in demonstrating that a crawler tractor could work round the clock in orchards regardless of weather to get the heavy disking of cover crop out of the way and leave it chopped into the soil as mulch. That was a gasoline tractor that set up a new world's record for the non-stop operation of an orchard tractor. Standard Oil Company of California furnished the fuel and oils for the entire run of 20 days and nights before the tractor was officially stopped by the Governor of Oregon as it paraded across the Oregon State College campus with the student body and visitors looking on as orchard tractor history was made. Only a year earlier, the bigger crawler Cat. thirty made a similar demonstration in an irrigated prune orchard near San Jose. Hence, the orchard tractor had definitely arrived. But by 1931, the diesel tractor came into the picture and from then on the swing from the old established gas tractors that had arrived were rapidly replaced by diesels as fast as the sizes came down to orchard size. The first Sixtys, Fiftys and Fortys were rather large for orchard work once the trees got past their first year, though they were sweeping the West Coast grain, flax, cotton, and vegetable fields like an old-fashioned Kansas cyclone as they demonstrated their ability to cut fundamental farming costs in half and pay for themselves when the acreage and hours work were in sight to keep them moving. So, before the recent war arrived, the diesel tractors for orchard and grove had come down to orchard sizes with low rear seat for orchard work. Now they are everywhere in crawler makes with four different kinds on wheels moving into orchards as fast as they get delivered. Allis-Chalmers, International, Caterpillar, Oliver, Deere, Massey-Harris and Sheppard are all beginning to appear in this fruit and nut field to cut costs and insure profits as the post-war shift in prices puts the squeeze on the farmer to compel better management via better tooling and teaming of labor used in production.

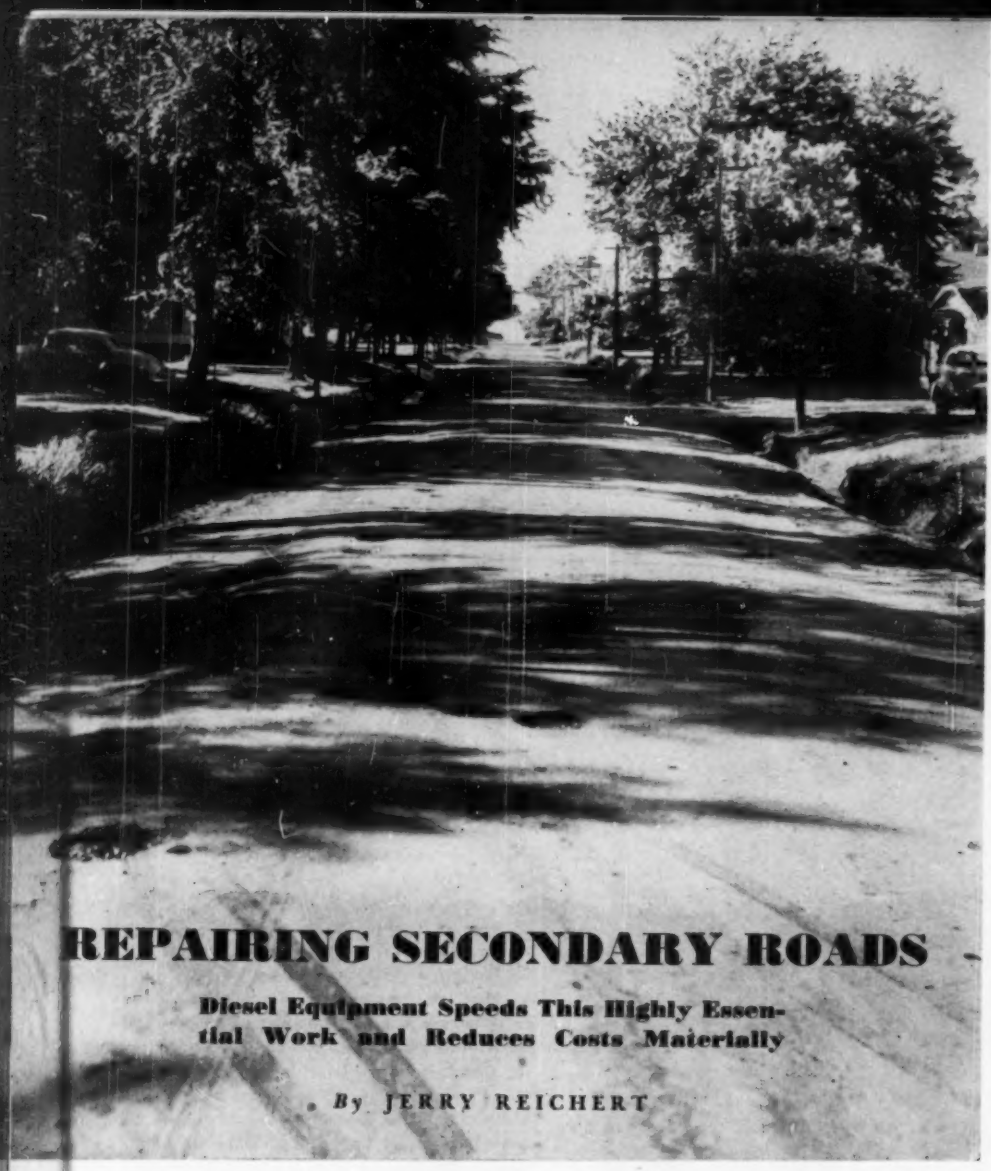
TABLE I

Combined Crop Production — California

(Excluding numerous minor crops for which records or estimates are not available)

Year	*Fruit and Nut Crops*	*Commercial Vegetables*	*Field Crops*	*Totals*
		Thousands of Tons		
1932-41 Average	5,452.6	2,071.8	9,293.3	16,817.7
1942	6,419.8	2,616.8	10,844.6	19,881.2
1943	6,833.8	2,834.0	10,168.6	19,836.4
1944	6,996.3	3,251.5	10,550.2	20,798.0
1945	7,512.3	3,431.7	11,073.4	22,017.4
1946	7,560.2	3,972.7	12,359.7	23,892.6
1947	7,545.3	3,920.0	13,078.9	24,544.2
1948	6,963.9	3,456.5	13,144.8	23,565.2
1949	6,350.5	3,512.1	13,179.4	23,042.0

1949 totals in per cent of 1948—98 per cent.
1949 totals in per cent of 1947—94 per cent.
1949 totals in per cent of 1932-41 average—137 per cent.



REPAIRING SECONDARY ROADS

Diesel Equipment Speeds This Highly Essential Work and Reduces Costs Materially

By JERRY REICHERT

Section of Mills Street, an old oil mix surface, in Carrier Mills, Illinois, showing street condition before a demonstration of the Caterpillar diesel No. 12 Motor Grader and the Athey Force Feed Loader with new portable breaker.

Caterpillar diesel No. 12 Motor Grader scarifying old gravel and rock road to depth of 6 inches on Harco Road at demonstration 4 miles west of Harrisburg, Illinois.

SPEEDY and economical resurfacing of deteriorated gravel and oilmix roads with in-place materials was demonstrated recently for county and municipal officials near Harrisburg, Illinois, by John Fabick Tractor Co., of St. Louis, Missouri, Caterpillar dealer, who has a branch office at Marion, Illinois, and Athey Products Corporation, Chicago, Illinois. With the assistance of Southern Illinois Association of County Superintendents of Highway and the Illinois State Highway Department, Carbondale, Illinois, the participating companies demonstrated the effectiveness of the Athey Force-Feed Loader with the new Portable Breaker and the Caterpillar diesel No. 12 Motor Grader, as a team for reconditioning coarse gravel and old black-top surface roads.

Location of the first section of the demonstration was four miles west of Harrisburg on the gravel road to Harco, Illinois, near its junction with Highway 13. The equipment was then moved to a section of Mills Street, a black-top road running north to Highway 13, at the north city limits of Carrier Mills, Illinois. More than a hundred interested observers consisting of county highway superintendents, county supervisors, street superintendents, highway engineers, city commissioners, mayors of nearby towns, and including Athey, Fabick and Caterpillar representatives, attended

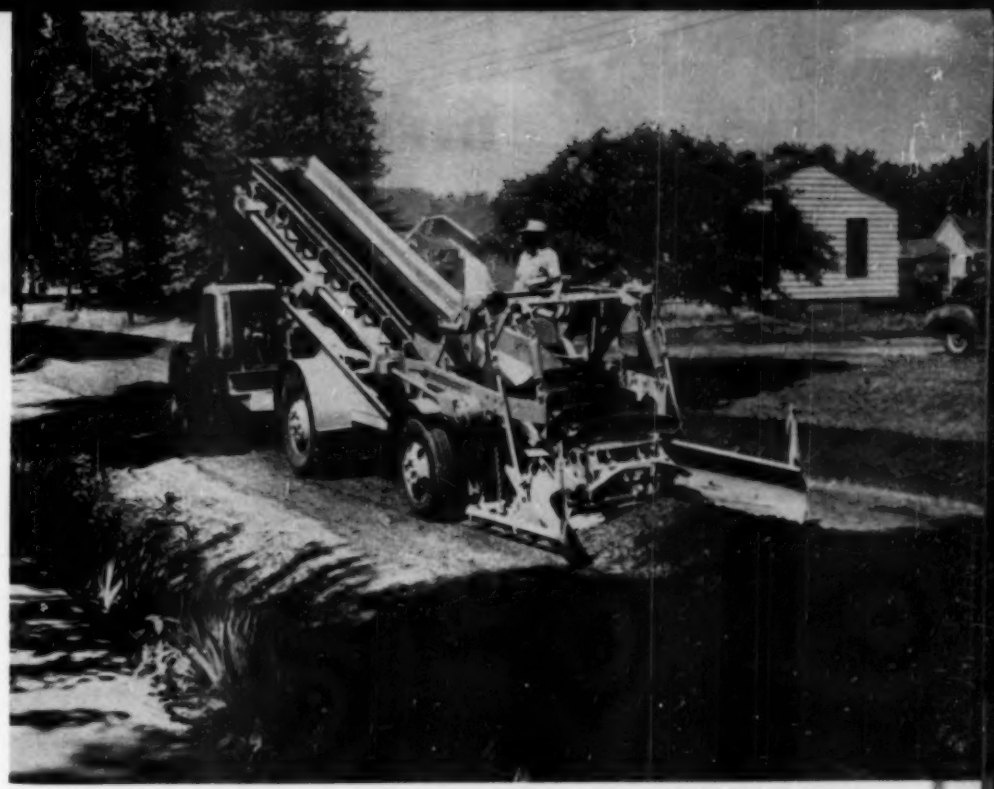
The morning half of the program consisted of scarifying a 400-foot section of the Harco gravel road with the Caterpillar diesel No. 12 Motor Grader, and blading the scarified material into windrows which were picked up by the Athey Force-Feed Loader and dropped through the Portable Breaker mounted on a trailer and pulled by the Force-Feed Loader. Then the Motor Grader bladed the crushed material out to a smooth surface. Average oversize of the gravel was 4 inches, and fines ran about 80 per cent. The roadbed was scarified 10 feet wide to a depth of 6 inches, and the material was bladed into two windrows, the first averaging two cubic feet per lineal foot and the second averaging 2.7 cubic feet per lineal foot. It took 67 minutes to run the two windrows through the breaker, thus making the production of the machine about 90 tons per hour.

Of course, the length of run was much shorter than the average section of road that would normally be reworked, necessitating more frequent turns. The production would also be higher on longer stretches where one piece of equipment would not have to wait until the other had finished working. Total time to scarify, windrow, crush and level the 400-foot section was one hour and thirty-five minutes. At the afternoon session on Mills Street in Carrier Mills, Illinois, a 450-foot section of a 15-year-old oilmix road was reclaimed. The order of operation consisted of scarifying the old black-top 20 feet wide to a depth of 6 inches with the No. 12 Motor Grader, windrowing the scarified material, picking up the windrowed material with the Athey Force-Feed Loader and running it through the Portable Breaker, and leveling off the crushed windrows with the grader. The material was then "shot" with No. E-3 road oil, windrowed again by the No. 12, mixed thoroughly by the Force-Feed Loader, then bladed out smoothly by the Motor Grader.

The original surface was extremely pitted and marked by numerous chuckholes, and the material was composed mostly of oil-impregnated sand and gravel. Average oversize was 3½ inches, and fines were approximately 65 per cent. The scarified material was bladed into three windrows averaging about 3 cubic feet per lineal foot. It took 70 minutes to pick up and crush the three windrows, giving the Portable Breaker a production figure of 180 tons per hour. The entire 450-foot section was scarified, windrowed, crushed, spread, oiled, windrowed, mixed and bladed into final shape in a total time of three hours and twenty-nine minutes.

The Athey Portable Breaker was operated at 980 rpm. on both road sections worked, and it has a capacity of 50 to 200 tons per hour, depending upon the material and the gradation required. The power unit for the machine is a Caterpillar diesel engine rated 58 horsepower at 1,600 rpm. The breaker crushes all rock and aggregate over 1-inch in its largest dimension. As the material enters the breaker hopper, it is deflected by a rubber baffle onto a vibrating gridiron with 1-inch spacing. Most of the fines less than 1-inch pass directly through this gridiron to the roadbed. The oversizes drop through check flaps into the impact mill, where eight impact hammers aligned in two rows forcibly batter the material against the breaker plate, shattering the larger pieces until the reduced material falls to the road surface. The hammers, weighing 51 pounds each, are made from 12 per cent manganese steel castings and have replaceable tips.

Manufacturer's recommendations for the Portable Breaker state that road surfaces should be ripped up so that no pieces are larger than 8 inches across their largest dimension. But to illustrate how the machine could handle large pieces, sections of an old concrete culvert, somewhat larger than the specified size, were thrown into the windrow several times. They were picked up by the feeder blades, whipped up the conveyor, and dropped into the breaker, which reduced them to workable size without difficulty. The action of the Portable Breaker gives a graded mixture to the crushed surfacing material of roads. On blacktop surfaces, this characteristic permits a saving by reducing the amount of road oil necessary to give the material the desired cohesive quality. The crushing and mixing of the old black top allows the existing oil in the material to be more equally distributed, thus requiring less new oil.



Athey Force Feed Loader and Caterpillar diesel powered portable breaker picking up and crushing windrowed material from old oil mix road on Mills Street at demonstration in Carrier Mills, Illinois.

A 450-ft. section of Mills Street in Carrier Mills, Illinois, after it has been scarified, crushed, oiled, mixed, and relayed during demonstration featuring the Athey Force Feed Loader and portable breaker, and the Caterpillar diesel No. 12 Motor Grader.

Caterpillar diesel No. 12 Motor Grader respreading scarified, crushed, oiled and mixed material from old oil mix surface on Mills Street at demonstration in Carrier Mills, Illinois.

DIESEL SHIP CHILI

French Line Takes Delivery of an 8,300 Dw. Ton Combination Passenger and Cargo Ship

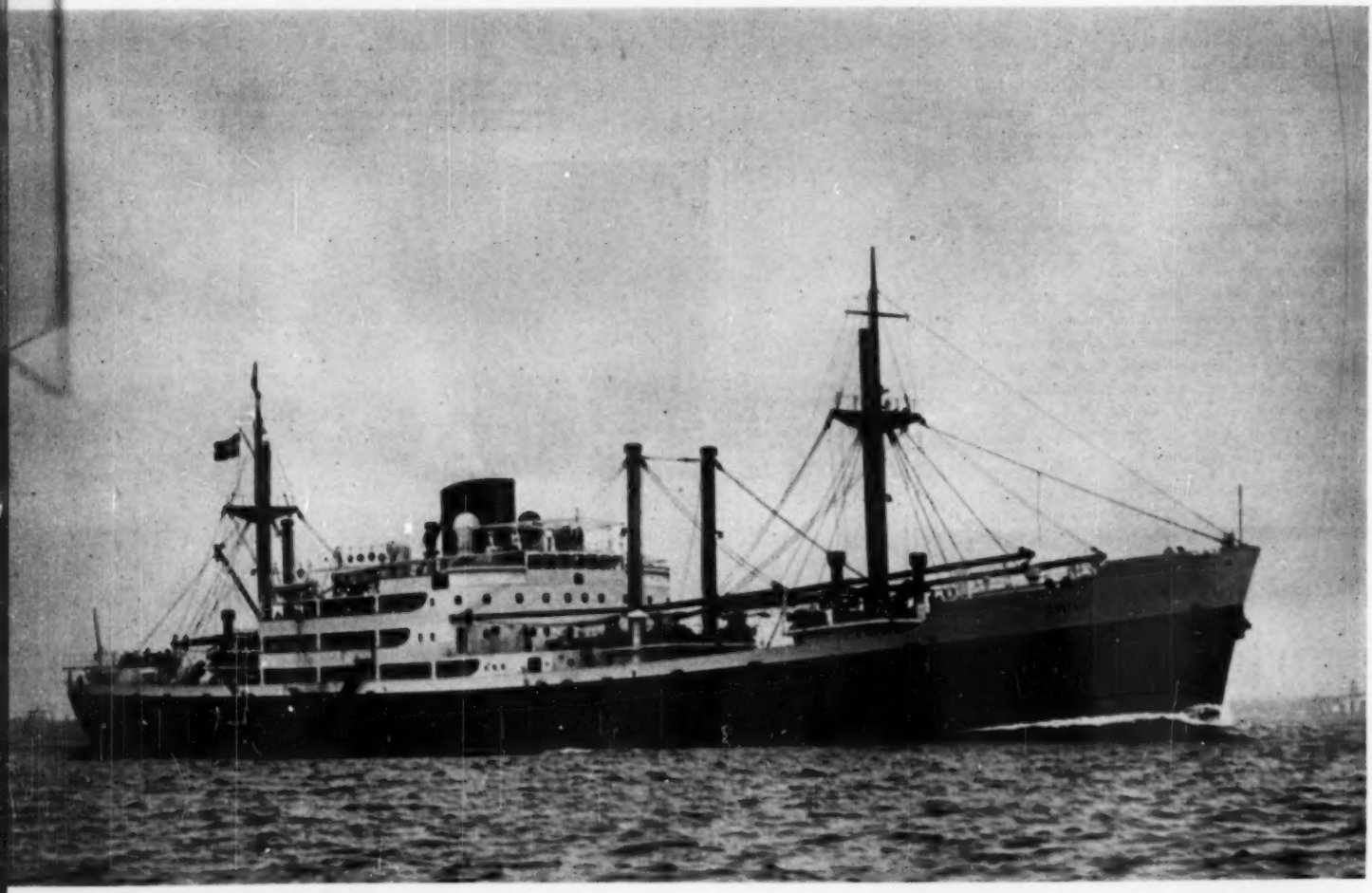
ON the 29th June, 1950, at Burmeister & Wain's Yard No. 662, the cargo ship *Chili* was delivered to Le Ministre des Travaux Publics et des Transports (La Marine Marchande), Paris, who immediately handed over the ship to Compagnie Generale Transatlantique, Paris. Previously, on 13th and 14th June, the ship had undergone extensive trials in loaded condition. The cargo consisted of water and oil in all tanks, and of about 6,500 tons of sand in the holds.

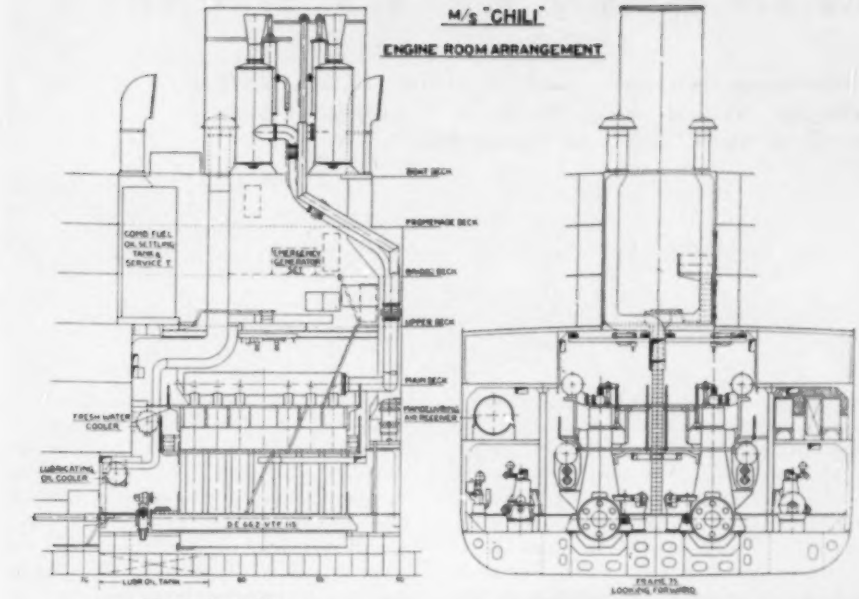
Consumption test was made in the Sound and the Kattegat at a speed of 15½ knots, and the result was a total consumption for main engine and all auxiliary engines corresponding to 58.4 kg. of oil per minute at 8.300 tons dw. and about 130 g/i.h.p.h. During the subsequent full-speed test over the measured mile at the island of Hven, a speed of 17.7 knots was attained. After the remaining normal tests had been made to the entire satisfaction of the French representatives, the ship returned to Copenhagen for its final completion. At the trials, the Marine Marchande was represented by M. Poirier, and Cie Generale Transatlantique by M. Dore, M. le Talaer, and M. Cusset.

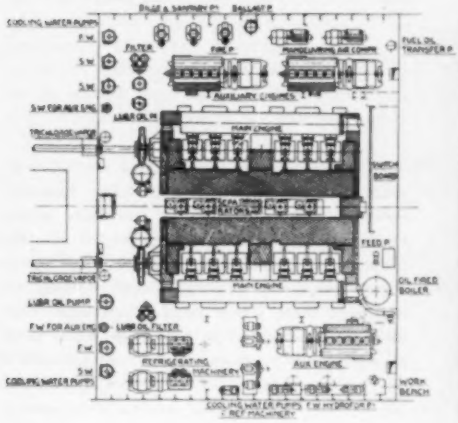
The vessel has been built to Bureau Veritas' highest class, as an open shelterdecker with forecastle and houses amidships and aft, welding has been widely used. Main characteristics of D/S *Chili* are:

Length between perpendiculars	136.3 m
Beam	18.7 m
Side height to upper deck	11.7 m
Side height to 2nd deck	9.2 m
Draught to summer load line	7.85 m
Corresponding deadweight	8,820 tons
Total capacity of holds	14,876 m 3 bales
Thereof refrigerated in total	1,755 m 3 bales
Total capacity of fuel oil tanks	1,124.2 tons oil
Gross tonnage about	6,655 tons

The vessel, a twin-screw diesel ship with two through-going decks, raked stem, soft nose, and cruiser stern, has a very fine appearance with unbroken, attractive lines that give the impression of speed as well as of great seaworthiness. The machinery is placed amidships. The five holds have







an extra tween-deck. Upper and lower tween-decks of No. 3 hold are fitted for transport of fruit at −2°C., while part of lower tween-deck in No. 4 hold is fitted for transport of meat at −12°C. The refrigerating machinery is a Freon plant. All hatchways, to weather decks as well as tween-decks, are fitted with Burmeister & Wain's quick-closing patent steel hatch covers. The ventilation of the holds is a combination of mechanical and natural ventilation.

The rigging consists of two masts and four derrick posts, the hatchways being served by a total of eight 5-ton, six 10-ton derricks, and at No. 2 and 4 hatches respectively, one 30-ton and one 20-ton heavy derricks. All holds are provided with CO_2 fire extinguishing system combined with smoke detector in wheel house. D/S *Chili* is fitted with fully up-to-date navigational instruments, wireless direction finder, Brown's gyro compass, and echo sounder of the type S.F.R. Carpentier M.S.

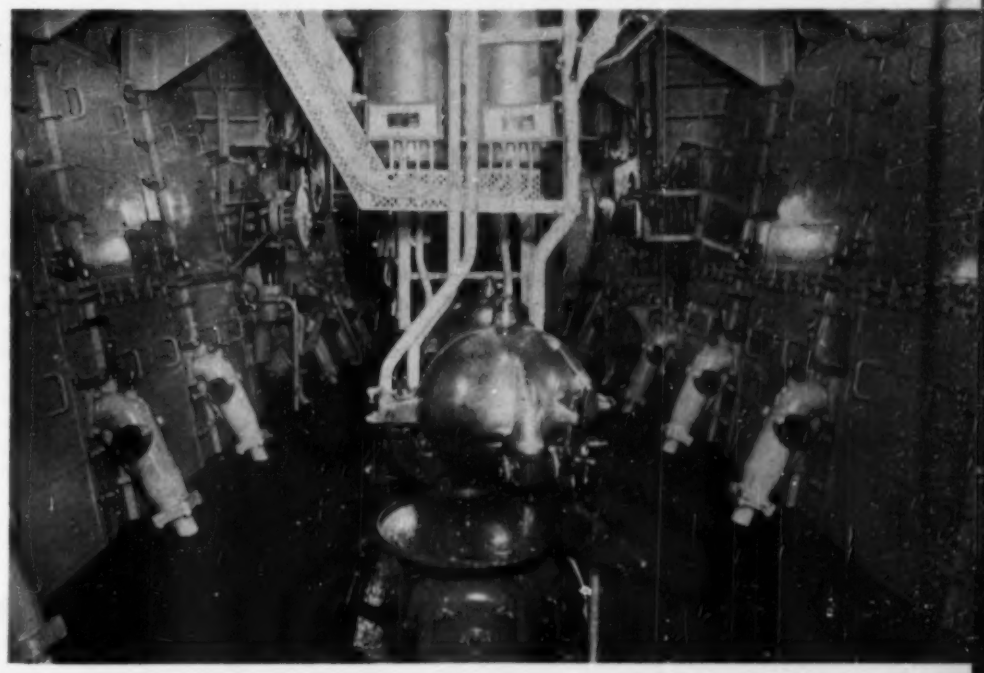
In accordance with the latest developments, the deck houses amidships have been considerably enlarged so as to accommodate both passengers and the entire crew. The upper bridge deck is reserved for the 12 passengers and the captain. The passengers are distributed in four 2-berth and four 1-berth cabins, all luxuriously fitted with polished bulkheads of lemon and bird's eye wood, and furniture of steel or polished elm. The cabins have separate bathrooms and lavatories. The beautiful and nicely fitted dining, smoking and sitting rooms of the passengers are kept in lemon, mahogany and birch, with furniture of walnut, mahogany and birch. The spacious accommodation of the captain, with polished bulkheads and furniture, includes separate bedroom and bath.

The officers have large single-berth cabins with mahogany furniture, while the crew has partly single-berth, partly two-berth cabins with light-colored oak furniture. Besides the messrooms, officers as well as ratings have large sitting rooms. The heating is electric throughout except in officers' messes and dayrooms, which are steam heated. All living quarters are mechanically ventilated.

Main engines—Two Burmeister & Wain's direct reversible, single-acting, 2-stroke, 6-cylinder crosshead diesel engines with airless injection. Cylinder diameter 620 mm, length of stroke 1,150 mm, total normal output 8,850 ihp., corresponding to about 7,100 bhp. at 148 rpm. *Auxiliary Engines*—Three 5-cylinder, 4-stroke trunk engines with airless injection, each direct coupled to a dynamo of 200 kw. at 220 volts and 500 rpm. The diesel cylinders have diameter 245 mm, length of stroke 400 mm. Output per engine 300 bhp.

Lubricating and cooling system—All large pumps are vertical and direct coupled to electric motors by resilient couplings. There are three screw pumps for circulation of lubricating and cooling oil, three centrifugal pumps for salt cooling water, and two pumps for fresh cooling water. For cooling of the auxiliary engines there are two pumps, one for salt water and one for fresh water. The lubricating oil is drawn from the bottom tank underneath the main engines and is discharged through filters and oil coolers to the main engines, where it is used partly for cooling of pistons, partly for lubrication of bearings, whereupon it flows back to the bottom tank. The fresh water pumps draw from the main engines and discharge through the fresh water coolers back to the main engines. The system is closed, and an expansion tank is fitted in the casing. The salt water pumps draw the sea and discharge through the oil coolers to the fresh water coolers and overboard. The fresh water coolers and the oil coolers are of the same type, having steel mantle and cast iron end covers, tube plates and tubes of yellow metal.

Maneuvering platform.



SEATTLE STREETS KEPT UP BY DIESELS

Tractors Bulldoze Garbage Dumps and Gravel Pits; Roller Patches and Resurfaces Worn and Broken Paving; Patrols Blade Gravelled Surfaces and Clear Off Snow

By F. HAL HIGGINS

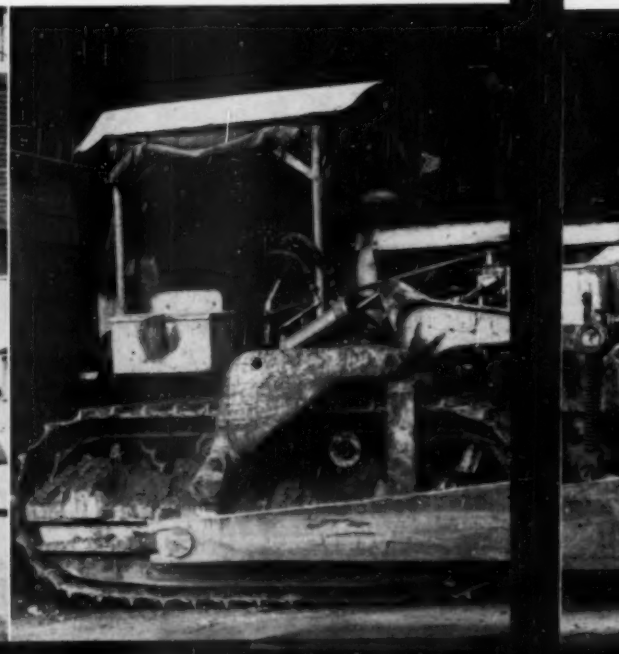
SEATTLE, like other Pacific Coast cities, has its problems outgrowing its facilities, to put it in staid report language. It has got too big for its britches, to use the sidewalk lingo. But Seattle has a Department of Engineering staffed by men who know how to meet such emergencies as too many automobiles and pedestrians for the pre-war streets, bridges and roads leading into and out of the famous B-36 town. Your Old Reporter took a fresh post-war look at Seattle recently and was surprised at its progress in solving it street problems where most of its rival coast cities have yelled "Fast Driving" instead of obsolete streets that pile up the traffic slaughter to new records every month and year and drop the cities and states farther back in the race with motorized traffic. Suddenly, the visitor noted the water front was guarded and protected from destructive fires along the shipping areas by a diesel boat. That brought questions about how much city-owned diesel-powered equipment was on the job helping build and safeguard Seattle. Tom Herbert, the Chamber of Commerce public relations man at the writer's elbow on this day, referred the questions to the City Engineer. The reply was prompt and convincing as to the place of diesels in his city's tool bag.

"The Maintenance Division of this Department," said J. Robertson, Principal Assistant City Engineer, "operates nine pieces of diesel-powered equipment, all other equipment being either gas or electrically powered. Following is a list of the diesel equipment: one RD4 with dozer, one RD7 with dozer, one 10-ton Huber roller powered by Cat D-4 engine, three Allis-Chalmers patrol blades, three Caterpillar diesel motor graders. The small RD4 with bulldozer is used primarily on the various garbage dumps and the RD7 in our gravel pit operations. The Huber roller is used by the asphalt crews in the patching and resurfacing of asphalt pavements, and the patrol blades for the surfacing and maintenance of graveled streets within the city. These blades are also used for snow plowing when necessary during the winter months. In regard to street mileage in Seattle, we have a total of some 1,350 miles of platted streets which are at present classified as follows: About 875 miles of streets improved and paved; 250 miles of graded streets, a good share of which have yearly applications of sprinkle oil applied by the property owners negotiating with the oil companies; and 225 miles of ungraded streets, but with some usable roadways existing on a portion of this mileage. For the maintenance of our graded and usable ungraded roadways, we employ nine patrol blades in our operation of maintenance. We use both crushed gravel and crushed ledge rock aggregates for maintaining the surfaces of these graded roadways, using a ¾-inch minus aggregate for a dress coat finish. On the question of oiling these graveled roadways, these oil jobs are accomplished by the property owners negotiating directly with private oil companies for the oil application and taking care of the cost of the oil with the oil company direct. The city does prepare the roadways for the reception of the oil by scarifying and shaping the surface. No guarantee is given by the city for the maintenance of such temporary roadways and they are broken up at such time as chuck holes develop to the extent that they are hazardous to traffic.

"On the problem of snow and ice control, ordinarily Seattle's winters are quite mild. However, about once in every three or four years, winter conditions become sufficiently severe so that the problems of maintaining traffic become rather acute. During the past two winters we have encountered more severe weather conditions than we have experienced in Seattle in many years. In solving our problem of snow and ice control we employ a program of heavy sanding and salting, and snow plowing and removal when needed. In the city we have set up a plan covering arterial, semi-arterial and bus route streets, comprising a total of 330 miles. This mileage gives a pattern

City of Seattle's dieselized road roller pauses for its picture in the streets of that famous Alaska supplier.

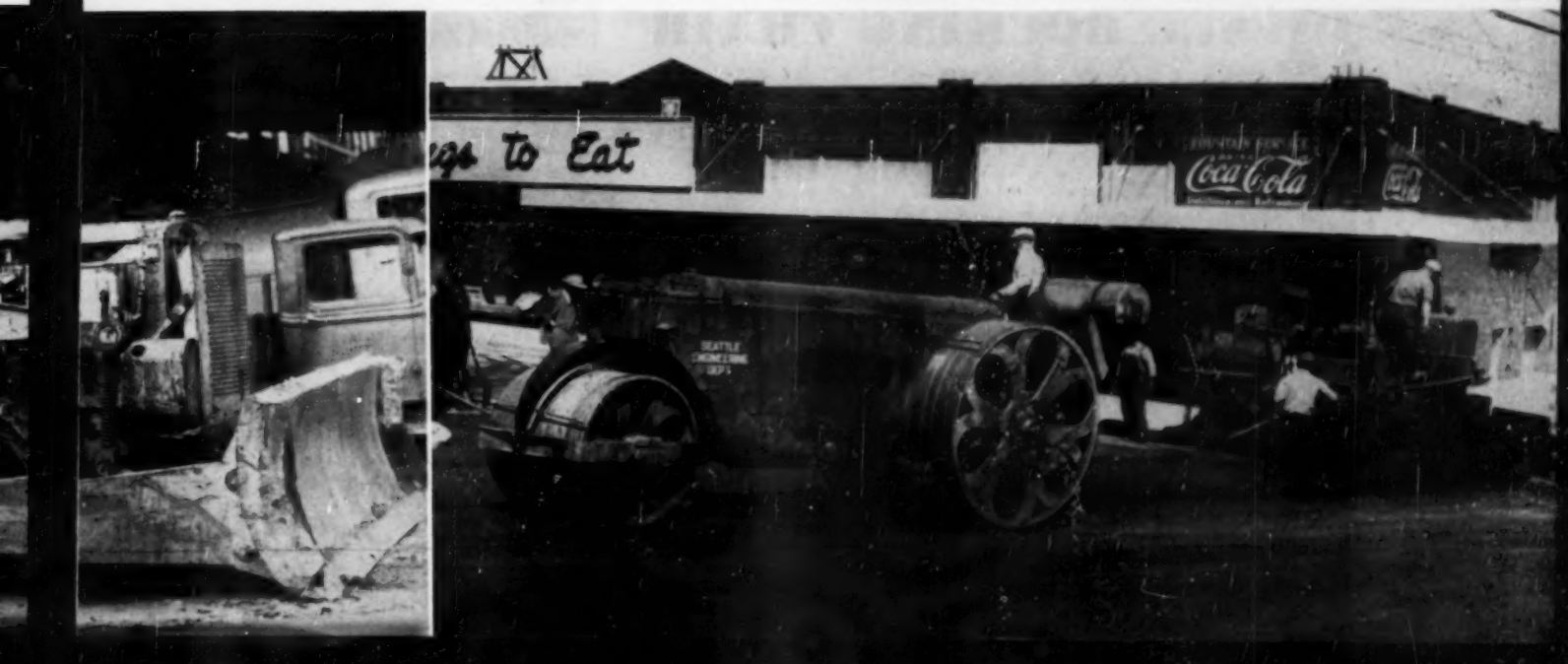
This D4 crawler diesel tractor with bulldozer on its nose works on City of Seattle garbage dump and gravel pits.

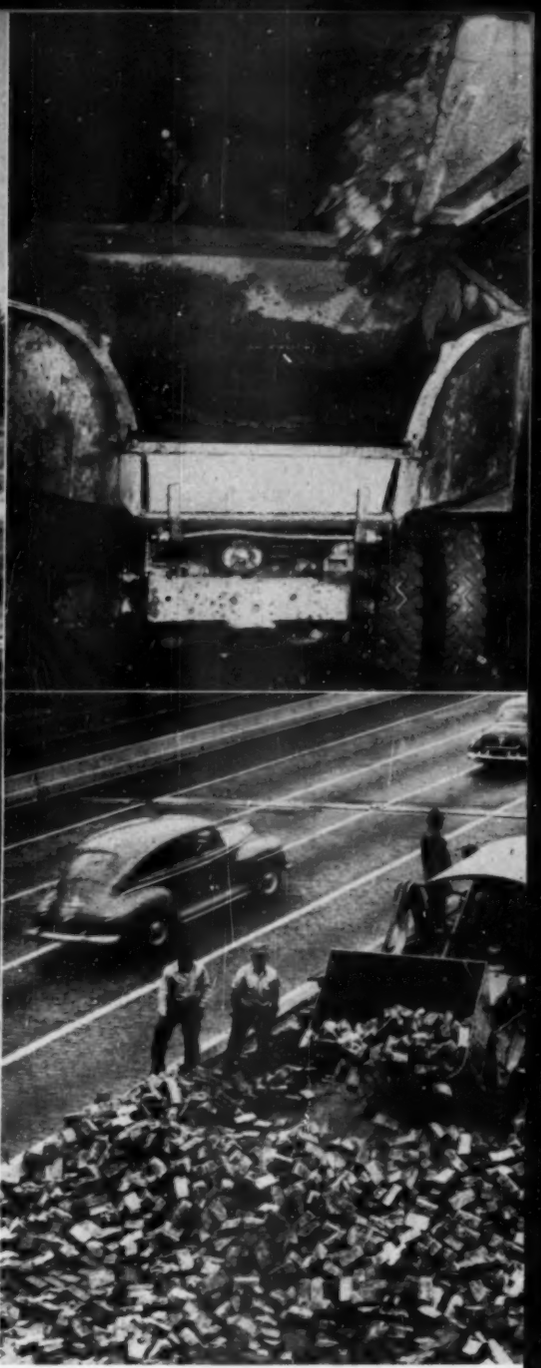


over the city which adequately covers our need for traffic movement. Sanding is performed usually on the portion of this mileage where the heavier grades exist or on any of the mileage where conditions exist of sufficient hazard to cause traffic tie-ups. The sanding is accomplished by the use of mechanical spreaders.

"When snow falls occur of sufficient magnitude to require plowing, patrol blades are used in the work. The department owns nine patrols, and this number is increased by the hiring of blades from local contractors and equipment dealers. We keep a constant inventory of the availability of this equipment, and in the early fall, before the snow and icy weather occurs, we contact all owners or such equipment, securing the names and phone numbers of either owners or operators whom we may call either day or night. We have had good success with such a program. For example, last winter during one heavy fall of snow it was determined at about 11 o'clock at night that plowing would be necessary, and we proceeded to contact the owners of blade equipment. By 2:30 a.m. we had 15 hired blades, in addition to our nine in service. With a total of 22 to 25 patrol blades, we are able to perform one complete plowing on the 330 miles of arterials in about a 24-hour period. This number is usually available, and we have found patrol blades admirable for such service. In addition to our patrol blades we have a dozen or fifteen truck plows, but in the past 8 or 10 years we have used them on only one or two occasions, as the patrol blade itself is a much more efficient piece of equipment for such service."

Re-paving in Seattle has a diesel powered Huber roller rolling down the warm blacktop as it is left by the machine just behind the roller.





RockerShovel as road-grader and excavator.

A DIESEL ROCKING CHAIR

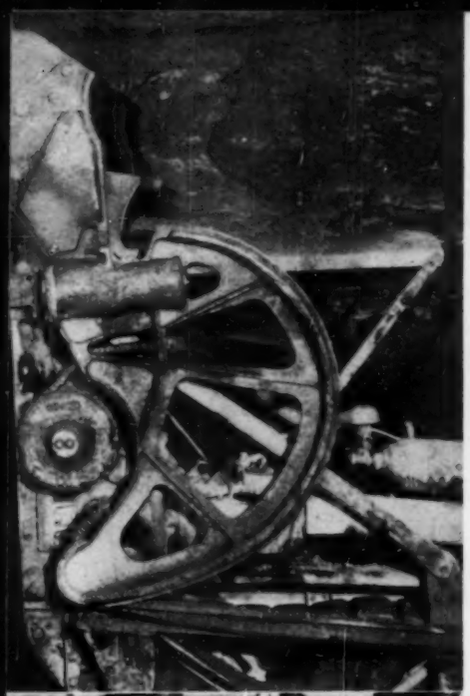
By JAMES JOSEPH

MINING men following a back-breaking day shoveling up after blasting crews used to complain of their lot as they rocked on many a mining shack's front porch. As the story goes, one bright mucker (that's what they call the men who who do the shoveling-up job) hit upon the idea of harnessing the rocking chair principle to power—and doing the clean-up job that way. The result is Eimco Corp.'s RockerShovel, which was originally electric or compressed-air powered and used underground. Now it's come above ground, hitched onto a diesel, and is doing all sorts of dirt-loading jobs for construction.

Simply constructed, the RockerShovel bucket unit is mounted in an independent unit on a Caterpillar D-tractor. With the bucket swinging from two semi-circular rocker arms, the unit moves in, scoops up gravel, muck, or ore, and simply throws the load over its shoulder into waiting trucks or ore cars. An experienced operator can load eight cubic yards of gravel per minute. To do the same loading job by hand would require a couple of hundred men.

The rocker assembly can be detached from the D-4, so that the tractor may be used separately if need be. Five buckets have been designed for various types of work: 1 cu. yd., for heavy ore; 1¼ cu. yds., for rock; 1½ cu. yds., for light rock and earth; 1¾ cu. yds., for sand and gravel; and a 2 cu. yd. bucket for snow. Loading capacity is from 4 to 8 yards per minute, depending on the type of work and the experience of the operator. The loading cycle, from the time the bucket moves forward to take a bite until it overhead dumps, and returns to its ready position for another bite, is from 10 to 15 seconds. This is extremely high speed, but the RockerShovel's 48-hp. diesel engine has plenty of power.

There are several distinct advantages in this unit, besides its labor-saving. One of the most important is that the RockerShovel can remain in one position, yet load and unload. There's no twisting or



RockerShovel in mining operation underground.

Another recent application was loading paving blocks from the Delaware River Bridge between Philadelphia and Camden, N. J. These big Belgian paving blocks weigh about 15 lbs. each. One RockerShovel kept six 6-ton trucks on the move.

turning to load, since it throws its bucketful of ore or gravel behind. Another advantage is that power is taken off the front of the prime-mover D-4 Caterpillar, giving a flow of power at all times. Thus the shovel operator doesn't have to shift to neutral for bucket power, as in the case of rear power take-offs. The rocker arms are controlled by pull chains, which move the arms over a rail to the rear dump position. The minimum height, when in the dumping position, is 12 ft. The minimum length of the RockerShovel is 11 ft. The bucket operates a maximum of 12 inches below the track level for digging, or can dig out walls at any height along the bucket's travel. Width is 6 ft., 6 in. The bucket is the same width as the tractor, which means that the bucket opens a path for the tractor and for whatever ore cars or dump trucks may be behind it.

The bucket elevating mechanism consists of the Eimco rocker-arms rolling on heavy high-carbon steel rails, raised by link-type power chains and automatic accelerating reel. There's a single control lever for the bucket operation, and an automatic power cut-off at discharge to return the bucket. The main frame assembly, detachable from the D-4, is heavy structural steel electrically welded, of rigid pin-connected truss construction.

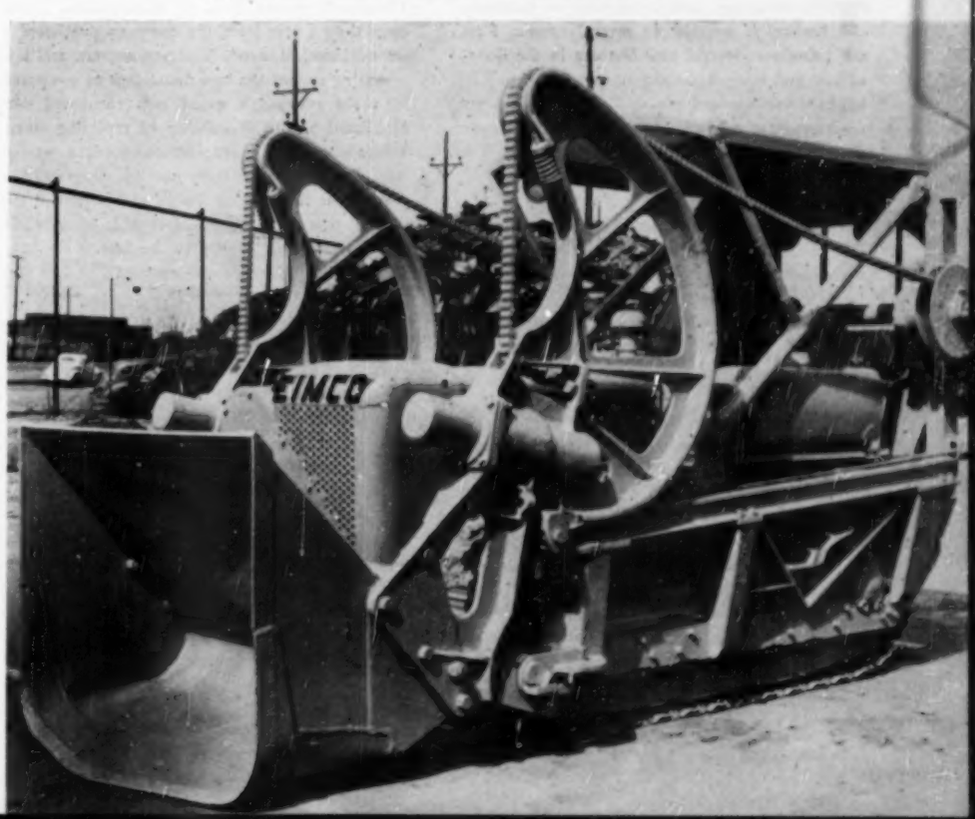
At present Eimco Corp., which manufactures the RockerShovel along with its long line of other mining equipment from a modest Salt Lake City plant, is turning out one or two units daily, but expects to up production. The RockerShovel is presently selling for $12,500 compared with $60,000 for the 3- or 4-yard capacity conventional power shovel. Construction men claim it can handle as much tonnage as the far larger but slower-moving shovel. Typical are some of the jobs which the RockerShovel is now handling, many of them far from the mining fields. In one road construction application, a unit spread sand and gravel over 3½ miles of standard road in one afternoon. It is presently being used underground in the Eagle Pichers lead-zinc mines, Joplin, Mo., where a mining room and pillar system is being dug, with room heights up to 125 ft. In this operation, an oxygen bottle is strapped to the hood, and introduced into the exhaust manifold, changing the small quantities of carbon monoxide fumes present in diesel exhaust to harmless carbon dioxide.

One of the unit's most useful and probably most far-reaching applications is in loading sand and gravel into rail gondola cars. Here, in one recent instance, the RockerShovel not only loaded a 60-ton gondola car in 21 minutes (something of a record), but hitched onto the cars and moved them out of the way so the operation could be continued. It has also been useful in excavation jobs. One recent job put up to the RockerShovel, to which it responded with eager-beaverishness, was on the Delaware River bridge between Philadelphia and Camden. On this bridge the RockerShovel was put to work loading heavy paving bricks onto trucks as bridge resurfacing went forward. The bricks, of ancient make, were Belgian paving blocks, each weighing from 15 to 20 pounds. The RockerShovel worked so fast that it kept six 6-ton dump trucks fetching and carrying through an 8-hour shift.

Another application, which surprised even its manufacturer, appeared recently in the food industry, when Holly Sugar Corp.'s Brawley, Calif., processing plant ordered one of the units to stockpile coke and limestone used in sugar making. This model was especially equipped with rubber tires. Eimco buys the standard D-4 diesel tractor from Caterpillar, then molds and fabricates the buckets and sub-units in its Salt Lake City plant. One of the interesting features, from a diesel standpoint, is that Eimco was able to adapt a new concept in shovel design to a standard diesel unit and do it effectively enough to arrive at something revolutionary in aggregate handling.

Somewhere along the line, it's said, the credit ought to go to those hard-working mining muckers who thought the rocking chair principle too good a thing to be wasted on somebody's rear end.

The Eimco RockerShovel mounted on a Caterpillar D-4 tractor.



BALTIMORE'S MOST POWERFUL TUG

New Diesel Tug for Baker-Whiteley Fleet Introduces Many New Elements in Design; Performance Exceeds All Expectations

By W. H. GOTTLIEB

THE *Resolute*, newest tugboat in Baltimore harbor, is notable on several counts: First, she introduces several new features in the design of hull and equipment; second, her 1,600-hp. Fairbanks-Morse opposed piston diesel makes her the most powerful tug in the harbor; third, her owners declare the vessel unequalled in those waters in speed and maneuverability.

For more than 70 years, the Baker-Whiteley Coal Co. has been mining and transporting coal, and early in that long history began operation of tugboats to assist in company shipping. Through the years, the tugs were called on more and more to help in docking ships and for other general towing service in the Baltimore area until the Tow Boat Department became an important and profitable element in Baker-Whiteley's business. Until just four years ago, all the company's tugs were steam-powered and of moderate size, but they were called on to handle larger and larger ships such as the big ore ships of the Bethlehem Steel Co. and the 624-ft., 26,550-ton super-tankers.

C. L. Hoblitzell, Baker-Whiteley president, recognized the need for more powerful tugs and contracted for an 86-ft. welded steel 800-hp. diesel tug designed by the prominent naval architect, Thomas D. Bowes, M.E., of Philadelphia. Little more than a year later, the company purchased a second identical vessel. The performance and low operating cost of the two diesel tugs as compared with the company's steam tugs convinced Mr. Hoblitzell of the desirability of replacing steam vessels with larger, more powerful, modern, welded steel diesel tugs. To carry out this program, Mr. Bowes was retained to design and supervise the construction of a new vessel capable of handling the heaviest jobs assigned to the fleet.

Named the *Resolute*, the new tug was built by the R.T.C. Shipbuilding Corp., of Camden, N. J., and sailed into Baltimore harbor on St. Patrick's day, 1950, flying a kelly green flag from her stern. The *Resolute* went into service on March 29th and had as her first job the docking of the *Venore*, one of the largest steamships trading at this port. The new tug not only has facilitated the heavier work in Baltimore Harbor and Chesapeake Bay, but has widened the range of operations of the company to include coastwise towing. The vessel meets all the requirements of the American Bureau of Shipping for harbor, bay and short coastwise towing. Mr. Hoblitzell, Port Captain Herbert C. Page and Chief Engineer Oscar Voight report that the tug's performance has been flawless.

The *Resolute* is a single screw diesel tug of welded steel with a length over all of 100 ft. 9½ in., a length between perpendiculars of 95 ft. 10 in., breadth molded of 25 ft. 0 in., and depth molded of 12 ft. 6 in. Because of the physical conditions existing in Baltimore harbor, it was considered advisable to keep the over-all length of the vessel down to approximately 100 ft., to permit better maneuvering in docking ships.

The steering qualities of the *Resolute* are quite remarkable. She has a large, balanced, streamlined rudder, the shape of which was determined by experimental work in a wind tunnel. The position of the rudder in relation to the propeller and stern post also was the result of scientific experimental work. The tug answers her helm immediately even when moving slow with the propeller dead.

The rudder is handled easily by means of an electro-hydraulic gear of the Rapson Slide type with full follow up. There is a Liquidometer helm indicator on the pilot house steering column. The stability of the *Resolute* was carefully calculated so that it would be possible for her to run alongside of large ships in the harbor while they are underway, helping them to dock without any danger of heeling or cutting under. With the

helm hard down at full speed, the *Resolute* turns in a very tight circle and shows very little inclination to heel. Using pilot house controls and working for a crash reverse, it is possible to have the tug dead in less than double her length. She has more sheer than is usual so as to keep her dry in her bay and coastwise work.

The general construction of the tug is on the longitudinal system, with heavy vertical flat bars spaced 22 in., from sheer to keel and deep frames spaced every 6 ft., with intermediate webbs and bilge bracket. The longitudinal extends from the forepeak bulkhead to the after peak bulkhead. Fore and aft of these bulkheads the frame is athwartships. Heavy intermediate floors are placed under the engine bearers. This type of construction, with the vertical stanchions in way of the engine room, produced a super strong hull that will stand the heavy pounding a tug is subjected to in service. In addition, this type of construction reduces vibration and is cheaper to maintain. The hull is divided by five water-tight bulkheads to provide strength and safety. The hull form is generally similar to the highly successful 100 D.P.C. tugs designed by Mr. Bowes for the Army engineers. The run aft is very long, giving good clearance for water to the propeller. This form has been the result of model development work carried out over a long period of years.

The design of the *Resolute* embodies many innovations. The shape of the bow is unusual. No stem bar is fitted. The bow is well rounded at the deck and this round is faired into the keel with a decreasing radius. The bulwarks forward are also rounded and set back from the bow. This not only protects them from damage but also provides a space to support the large bow fender so that it is not pushed down when the tug is working against the side of the ship in a seaway. Instead of the usual double guards on each side, a large blister has been incorporated into the construction of this area. This eliminates guard maintenance and the possibility of damage to vessels the tug may be towing from the alongside position. The blister is of open construction on the inside so that it can readily be wirebrushed and painted. The blister is rounded into the deck. The bulwark is set back 8 inches from the face of the blister and then raked inboard 4½ inches, so that no angle of heel of the tug will cause any damage to the bulwarks. In addition, particularly heavy bulwark construction was adopted with close spacing of the stanchions and with all chafing edges well rounded off to save wear on fender pennants and hawsers.

Another unusual feature of this tug is the raised poop aft that provides a steering gear room which accommodates the complete gear and still allows plenty of room for the engineer to make inspections. With this arrangement, only one tunnel is required through the after trim tank for the control shaft and this can readily be kept water tight. Also, this installation eliminates the usual long lengths of high-pressure tubing between the pumps in the engine room and the rams at rudder stock.

The propulsion engine of the powerful *Resolute* is a 10-cylinder, Model 38 D 8⅛, 10-inch, opposed-piston Fairbanks-Morse diesel which develops 1,600 hp. at 720 rpm. This is the compact, heavy-duty engine used so sucessfully by the Navy to power submarines through the last war. The *Resolute* is the first tugboat on the East coast to employ an opposed-piston engine. The engine is perfectly balanced and very quiet in operation. It drives the Ferguson propeller through a Falk Airflex clutch and reverse-reduction gear with a reduction ratio of 3.464 to 1.

The main diesel has a closed fresh water cooling system which includes a Ross heat exchanger. Piping is arranged so that in winter hot raw water can be discharged into the sea chests to prevent freezing or slushing up. The sea chests can be blown with compressed air to remove any foreign material that may come through the screens. The pressure lubricating oil circuit includes a Ross oil cooler and a Purolator filter. The engine exhausts through a Maxim silencer. Auxiliary power is provided by two 6-cylinder Fairbanks-Morse generating sets rated at 36 kw., 125 volt, D.C. at 1,200 rpm. These self-sufficient marine-type units are fitted with heat exchangers, fresh and raw water pumps, oil bath type intake air filters and siloncers, exhaust silencers and engine instrument panels. They are arranged for electric starting with 24-volt starting motors and battery-charging generators with 24-volt heavy duty batteries.

Compressed air for starting the main engine and for other purposes is provided by two air-cooled Quincy compressors, each with a capacity of 13.7 cfm. at 250 psi. They are mounted on a common base and v-belt driven by 3-hp. Fairbanks-Morse motors. Auxiliary equipment is complete and well arranged and includes Goulds fuel, lube and fire pumps, a LaBour self-priming bilge pump, a 17-point Almor exhaust pyrometer, Bowers ship service batteries and a Smith Meeker switchboard.

The heating for the vessel is a forced hot water system with an oil-fired Way Wolfe boiler and convector radiators. There is a complete exhaust ventilating system for the engine room, with a blower for exhausting both above and below the main grating. The *Resolute* is designed for swift and efficient operation. There are pilot house controls for the engine, both port and starboard, and also on the after end of the main deck house, where there is also a control for the steering gear. Deck controls are by Allis-Chalmers and Henschel. Pilot house equipment also includes an RCA marine radio.

The *Resolute* is attractive and convenient as a place to work and live. The crew's quarters are especially commodious. There is a very large captain's stateroom just aft of the wheel house. Below the wheel house there is a combination galley and mess room trimmed in stainless steel and equipped with an oil-burning Shipmate range and a McCall electric refrigerator. There is also a deep freeze in the forward hold, a Burke water supply system provides sanitary and potable water. Aft of the galley there are four double staterooms on deck for the crew and aft of the crew's quarters is a large comfortable stateroom for the engineer. Opposite this on the port side there are bathroom facilities for the crew and the officers. A separate toilet room is provided for the owner at the after port end of the main deck house. There is a deck locker in the corresponding space on the starboard side.

Under the fore deck is a large storage hold with wire mesh lockers for storage of spare engine parts and other gear. There is also room for spare hawsers and other necessary spare gear. On the after deck there is a large electric-driven Wheeler capstan for handling the hawsers. The outstanding performance characteristics of the *Resolute* insure that this will be the first of many vessels of similar or identical design. At a time when the nation is mobilizing its resources, the speed and efficiency of these powerful tugs make them an asset not only to their owners but to the nation.

Thomas D. Bowes, Naval Architect; T. W. Drennen, Fairbanks-Morse New York Manager; John Carson, President of R.T.C. Shipbuilding Corporation.

DIESELS NEVER DIE

Twenty-two Year Old Fairbanks-Morse Engine in Marion, Kansas, Plant Still Dependable, Profitable Performer With Minimum Maintenance Costs; Both Plant and Output Grow.

By HENRY J. BARBOUR

IT is an obvious fact that the heavy duty diesel, with its replaceable cylinder liners and bearings, can continue indefinitely to produce its rated power. Even the factor of obsolescence has been in large measure eliminated by some manufacturers through careful design of new models to permit modernization of old engines in the field. The fact, however, that impresses the observer who visits many diesel power plants throughout the country is that so many diesels continue dependable and efficient service over a long period of years without replacing cylinder liners and bearings.

A case in point is the Marion, Kansas, municipal power plant, where a 560-hp. model 33 Fairbanks Morse diesel has been in service for more than 22 years. This unit is in operation daily and within the past year has run as much as 30 days without shutdown. The engine still has its original liners and only one bearing has been rebabbitted. A second unit in the plant is a 1,050-hp. model 33D Fairbanks-Morse diesel which was installed in 1939. Though this 11-year-old engine runs about 4,000 hours a year, all the original cylinder liners and bearings are still in use. Newest engine in the plant is a 1,200-hp. model 33F F-M diesel which went into service in 1948. Needless to say, there have been no liner or bearings changes on this unit.

Merely to keep diesels running over a long span of years without major part replacements is worthy of note, but it is equally important to check on the efficiency and economy of the veteran prime movers. Total maintenance costs for this three-engine plant average $280 a year of less than 10 cents per horsepower per year. Maintenance of an efficient load in this agricultural community of some 2,000 population has been a difficult problem. In spite of the load factor, which often drops below 50 per cent, the plant maintains an average production of 11 kw. hrs. per gal. of fuel consumed. With load factor at 75 per cent, the plant average is 12.5 kw. hrs. per gal. Lubricating economy has been excellent, with a plant average in 1949 of 4,837 hp. hrs. for each gal. of lubricating oil consumed.

Marion was among the pioneers in the employment of oil burning engines. The first units put into service back in 1929 were two solid injection DeLaVergne semi-diesels rated at 75 and 100 hp. Two years later the plant added two Busch air-injection diesels rated at 120 hp. and 165 hp. It was 10 years later, in 1924, that the first Fairbanks-Morse engine was installed, a Type Y unit rated at 300 hp. One Busch and the two DeLaVergne's were taken out at this time. This 300-hp. F-M engine served in the Marion plant for 15 years and then was sold to another Kansas municipal plant, where it is still in operation, rounding out a service record of 26 years. In 1926 a 360-hp. Style VA Fairbanks-Morse diesel was installed and the second Busch came out.

Newest engine in the Marion plant is this 1,200-hp. Model 33 F-M diesel installed in 1948. The Woodward governor, Nugent fuel filters, F-M fuel injection pumps and Madison Kipp cylinder lubricators can be seen in this view.

As noted, the first of the engines now running in the Marion plant, the 560-hp. unit, was installed in 1928. The 300-hp. unit came out in 1939 to make room for the 1,050-hp. engine. The 360-hp. diesel was removed after 22 years of service to make way for the 1,200-hp. addition in 1948. This brought the plant to its present capacity of 2,811 horsepower. Marion's long running diesels have been consistently profitable. The old 560-hp. engine, for example, led the plant to such substantial earnings that the city was able to pay off the total cost of the unit in just three years. There was enough additional profit to pay off $65,000 in water bonds. Profits have been maintained even in the present era of high operating costs. In 1949, revenues of the electric department were $76,825.59 and total expenditures, including costs of generation, distribution and administration, totaled $49,748.67, leaving a net profit of $27,076.92.

The operating record of Marion's diesels would not have been possible without heavy duty engines, without good protective accessory equipment and without sound operating procedures. All the engines are fully pressure lubricated and have oil-cooled pistons. Lube for the two big engines is circulated by built-in engine-driven pumps with motor-driven auxiliary pumps to circulate the oil to the bearings and pistons in starting and shut-

ting down the engines. The 560-hp. unit utilizes a motor-driven pump for regular lube circulation. Included in the lube-pressure system of each engine is a shell-and-tube oil cooler and a bag-type filter. Each unit also is equipped with a multi-element lube filter with cellulose filtration cartridges. Oil is drawn from the crankcase by a motor-driven pump, heated, filtered and returned to the crankcase. Wiper-ring oil is put through the filter and discharged to the crankcase. Cylinders are supplied by separate mechanical lubricators.

Soft cooling water is circulated by two motor-driven centrifugal pumps from a hot well through the engine jackets, through two heat exchangers and back to the well. One pump can handle the plant easily and the other serves as a standby. One exchanger is adequate for the plant's needs through the winter months, but both exchangers are used during the summer. City water is used for make-up in the closed cooling system and chemicals are added to soften the water. In emergency it is possible to run city water directly through the engine jackets at 60 to 75 lb. main pressure. Another pair of motor-driven centrifugal pumps puts raw water through the exchangers and over an atmospheric-type cooling tower. Hand-operated valves are arranged so that either the tower or the exchangers can be by-passed as necessary to maintain jacket water temperature at the desired level.

The 34 to 36 gravity fuel oil can be delivered by either tank car or truck and is unloaded into three 1,200-gal. horizontal tanks above ground by a motor-driven gear pump. The fuel flows from storage through a meter to day tanks in concrete underground chambers. The tanks are so arranged that some fuel will flow from storage to the day tanks by gravity so that the day tanks cannot run dry, but a motor-driven pump must be used to fill the day tanks completely. Engine-driven supply pumps draw oil from the day tanks and supply it through duplex filters to the injection systems. Scavenging air for these pump-scavenging two-cycle diesels is cleaned by multi-element impingement-type filters in separate concrete chambers outside the plant. Exhaust gases of the big engines vent through vertical snubbers while the smaller engine exhaust passes through an expansion pit and up a stack. For each engine there is a gauge and alarm panel with alarms on lube pressure and jacket water pressure. There is an exhaust pyrometer on each board. All the engines drive directly Fairbanks-Morse alternators generating 3-phase, 60-cycle, 2,400-volt current. The alternators are rated at 840 kw., 731 kw. and 375 kw. All three have 15 kw. chain-driven exciters.

The true veteran of the Marion plant is Superintenden James Blackim, who was on hand to install the first of the present diesels 22 years ago and has directed operations through the long decades of flawless service. Mr. Blackim long age set up a detailed maintenance schedule and has insisted that it be followed scrupulously. Undoubtedly this careful preventive maintenance program culminating in an annual overhaul for each engine deserves a share of the credit for the absence of major repairs. It is common practice to write off diesel engines in 20 years, at least for bookkeeping purposes. The Marion plant is demonstrating not only that good diesels never die, but that they can continue for more than 20 years to produce power at a profit.

Listing of principal equipment:

Engines: One 560-hp. Model 33, Type M, Fairbanks-Morse diesel; one 1,050-hp. Model 38D, Fiarbanks-Morse diesel; one 1,200-hp. Model 38F, Fairbanks-Morse diesel.
Alternators: Three 3-phase, 60-cycle, 2,400-volt alternators rated at 575 kw., 731 kw., and 840 kw. Fairbanks, Morse & Co.
Governors: Woodward Governor Co.
Fuel Filters: Wm. W. Nugent & Co., Inc., and Purolator Products Inc.
Fuel Meter: Badger.
Lube Oil: Nonpareil heavy duty diesel oil heavy, Standard Oil Co. of Indiana; industrial diesel HD engine oil SAE 30, Phillips Petroleum Co.
Lube Oil Filters: Midwest Filter & Mfg. Co.
Cylinder Lubricators: Madison-Kipp Corp.
Lube Oil Coolers: Schute & Koerting, Ross Heater & Mfg. Co., Inc.
Auxiliary Lube Pump: George D. Roper Corp.
Cooling Water Pumps: Fairbanks, Morse & Co.
Heat Exchangers: Ross Heater & Mfg. Co., Inc.
Exhaust Snubbers: Burgess-Manning Co.
Air Filters: American Air Filter Co., Inc.
Alarm Panels: Fairbanks, Morse & Co.
Pyrometers: Alnor; Illinois Testing Labs., Inc.; Brown Instrument Co.

The three Fairbanks-Morse diesels at Marion are (left to right) the 1,200-hp. unit installed in 1948, the 1,050-hp. installed in 1939 and the 560-hp. installed in 1928.

Lubricating oil is passed continuously through a Midwest cellulose-type filter which includes electric heating elements. There is one filter for each of three engines.

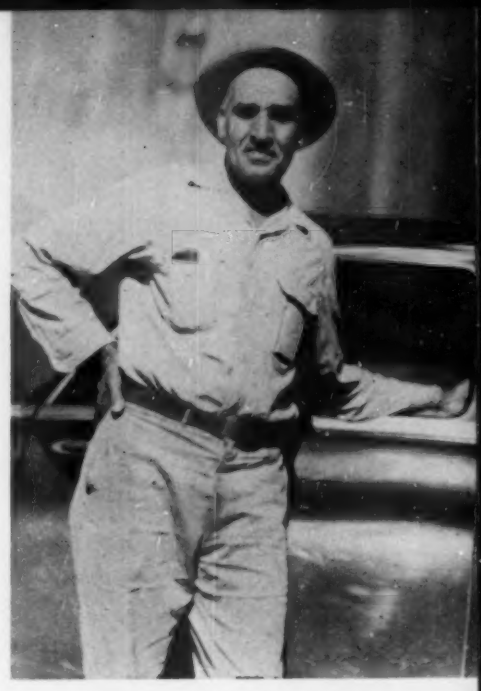
FROM "STOOPS" TO DIESELS

Hindu Pair Rise to High Rating as Rice Farmers in Sacramento Valley After 35 Years Hard Work on Railroad, Sugar Beet Thinning, Farming for Others; Depression and $100,000 Ownership of Diesel Powered Rice Machines.

By F. HAL HIGGINS

FARM labor – farm hands, hired hands, "stoops," "Bindle stiffs," or whatever term the local California public dubbed them–has undergone a dramatic rise in the public recognition of their importance. They are skilled mechanics drawing top wages on a level with the best Big Town pay in many areas of farming. Farm labor in California has had a long and rugged up-hill climb from hand tools and animal-powered machines to the modern diesel-powered equipment of 1950. With the Gold Rush a century ago, no man who had endured the hardships of ocean or covered wagon transportation to find gold wanted to bother with such unromantic jobs as farming. Hence the big importations of Chinese, Hindu, Japanese, and Mexican field hands over the past century. With violent fluctuations of economic conditions, there built up among the white labor of the day strong prejudices against all "foreign labor" that found work when the streets were lined with unemployed white labor. The Chinese had been brought in to build the railroads and the completion of the long, hazardous job left great numbers of them in the state available for such essential jobs as digging irrigation canals and levees. As the Chinese scattered up the Sacramento Valley to work on the big bonanza wheat ranches in the '70's and '80's, practically every town soon had its anti-Chinese Society aimed at driving out the "yellow" labor that was doing the heavy stoop jobs at a lower wage than the white man would work for. Later as vegetables and fruit came into the commercial farming system with irrigation, the Mexican, Hindu, and Japanese were brought in to do work the average white Californian would not do. He was neither mentally nor physically built for so much stooping as went with sugar beet thinning and loading, grape picking, asparagus cutting, and other hot, dirty jobs with hands and bent back instead of horses driven from a seat. The pioneer Californian was a horseman from the earlier days. He drove more horses in freighting and harvesting than did men in any other area of the world. His feats on horseback in carrying mail have become the saga of the Pony Express.

To get back to a pair of veteran California Hindus who dramatize the new order of California appreciation and recognition as good Americans and superb farmers let us look at Kalu Kahn and his partner, Ata Muhammed. That there were Hindu farm workers in the Sacramento Valley, your Old Reporter had noted from the first year he came out to California in 1937 and began studying mechanized agriculture from the tractor



Up from Stoop to Diesel! Kalu Khan, left, who worked on the Southern Pacific section gang at $1.50 a day for several years as he and his partner earned their stake in California Agriculture and learned the place of machines to multiple their work and put

Cummins diesel-powered Peterbilt truck and trailer load of rice.

their efforts on a business basis after they went diesel and pulled out of bankruptcy to farm ownership and independence. At right, Glenn County Agrictultural Commissioner P. V. Harrigan visits the Khan & Muhammed operations.

angle. Here and there he passed little groups of dark skinned, turbanned workers who were mentioned as Hindus, or "rag-heads," depending on who was talking and where. But down at Berkeley, as he walked through the library or across campus, a visitor would note one or two students from India who gave the Oriental from that section of the world considerable standing in the academic world. But whether in college or at hard ranch work, the Hindu always seemed a dignified and lonesome figure who did his job efficiently without strikes or argument, but in this recent war period, the writer has encountered a new Americanized and mechanized Hindu who has achieved independence and high respect from his pioneer California farmer neighbors, the local retail stores and the banks. He has arrived on his merits and is proud of both his present standing and his position as a Californian. His story is worth telling here because it is in the best tradition of the American Way, and yet might profitably be copied by those countries attempting to import the mechanized farming nowhow on which this American Way of Life and high standard of living is built. The reason the writer has selected the Hindu partners, Kalu Khan and Ata Muhammed, from among several such farmers and ranchers in Sacramento Valley rice is that he has for five years been watching their rice efforts and checking up with their neighbors, county officials who know them and tractor and combine men who sell and service their machines. "I've just sold Kalu Khan and his partner a diesel combine," said "Stan" Hahn, of Hahn and Mehrten, builders of the GM diesel-powered one-man bulk rice harvesters, two years ago, when seen at his office in Stockton. "That so? War prices must be making everybody rich in the rice farming game," the caller replied. But there were only about 25 of these $25,000 diesel machines out, and a rice farmer needed 400 or more acres with price of rice up in the $7 level to make such a machine an investment instead of a luxury. Such Hindus were worth looking in on. Next trip up the Sacramento the visitor did just that after talking with County Agricultural Commissioner Harrigan, who knows every farmer in the county and what his problems of weeds, seed, fertilizer and crops are. Ditto for the Jensen Farm Service, which sells and services 2,4-D for plane spraying of rice fields for weed control. And the leading rice growers all over the county—they all knew the two hard working Hindu rice growers who now had their own land and diesel-powered tractors and combines to make the work easy and highly profitable. These Hindus were recognized as good neighbors, good farmers, and good Americans. Never a word about Rag Heads—in fact, these farmers don't wear those dressy turbans wound around their heads in their new independence.

"We both worked on the railroad as section hands at $1.50 a day with shovels when we came to this country. Hot, hard work, but we were in America, with its wonders of men on machines lifting themselves from low jobs to higher ones. We were getting better wages and facing opportunities we could not hope for at home. I didn't know my present partner then, but we got acquainted as we worked together on these hard railroad jobs for

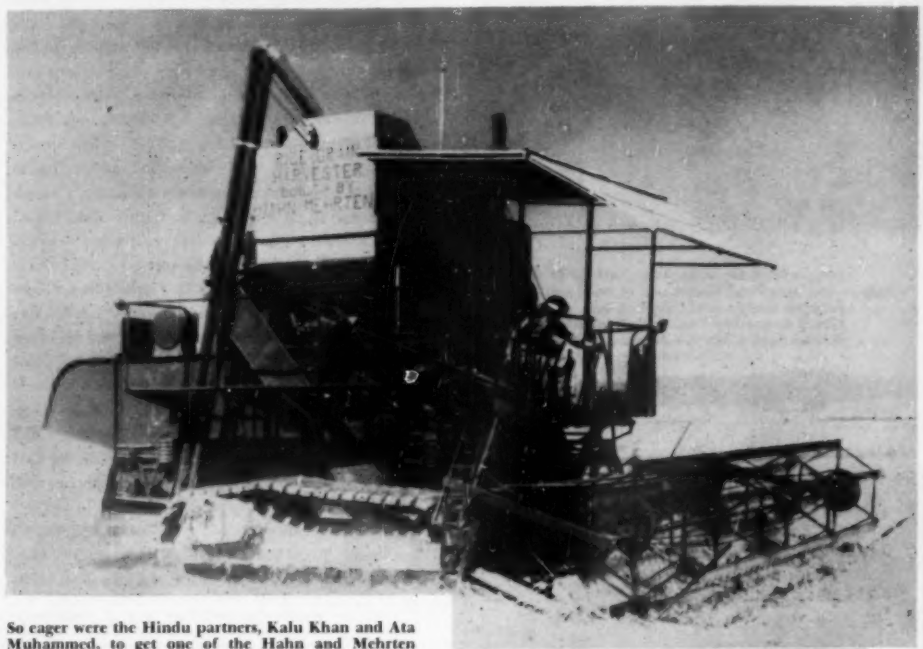
The G-M diesel tractor powers this Allis-Chalmers HD10 plowing for Fong Shew Ming, Chinese-American farmer who has rented this old Pearson ranch from the Hindu farmer partners, Kalu Khan and Ata Muhammed.

"There it is," smiled Kalu Khan as he drove his visitors across five miles of flat rice land ten miles southeast of Willows. His smile at the work the six diesel-powered farm machines that added up to over $100,000 investment expressed his endorsement of the diesel as the "American Way" that has replaced his own and partner's stoop work by hands that occupied nearly two-thirds of their 35 years in the United States. The diesels have made them independent land owners in the past decade.

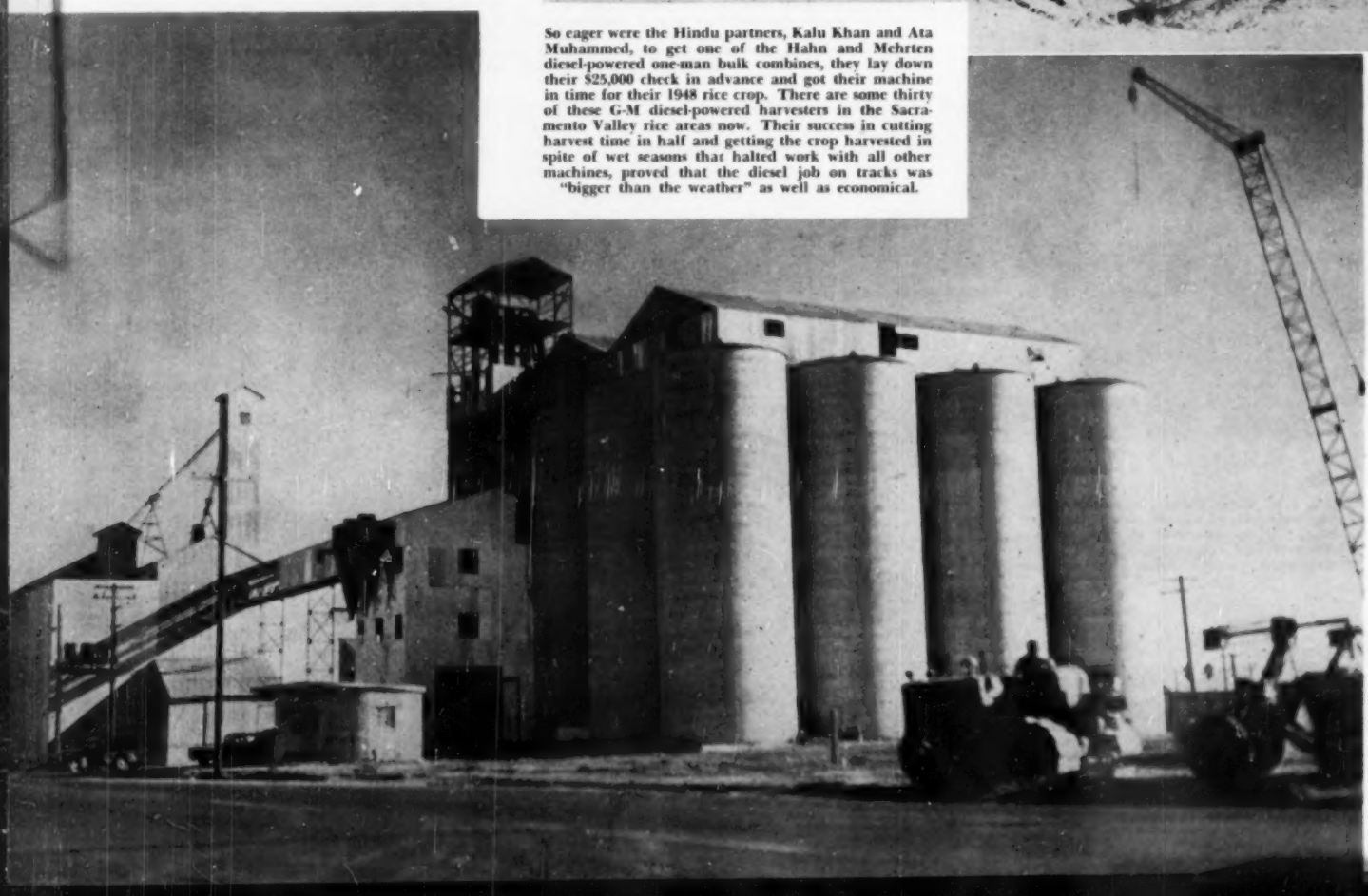
several years. Then we did farm work—beet thinning, topping and loading, shocking rice in the days before the combine appeared on this crop. Finally, we were taking contracts with farmers to do their farming for them in the production of their crops. That led to renting land for our own operations ,and we knew rice from generations of its production in India. We now own nothing but diesel tractors," said Kalu Khan, as he invited County Agricultural Commissioner P. V. Harrigan and the writer into the cool clean kitchen for a cool cola. You saw the combine when we first got it two years ago, remember. It is powered by a pair of GM diesels, one for running the threshing and elevating mechanism, and the other for propelling the machine across the field. The tractors are Caterpillar 40, D6, RD7, D7 and D9. We also have a new John Deere combine besides the big diesel built by Hahn and Mehrten. We will have 600 acres of rice this year, and another 800 acres in summer fallow. We have just bought 625 acres, and have to rent out some acreage on account of the history of our rice operations. That determines how much rice we can grow this year, you know. So the Pearson ranch is rented to Fong Shew Ming, Chinese farmer, this year.

"Yes, there has been a big change in rice farming in the Sacramento Valley with war and post-war prices. We went broke three or four times before this era of war prices, but we never quit. We kept on working. When we would get a little money ahead we would start up again and pay off our old bills. So, we have good credit now. We were forced through bankruptcy once, one of the oil companies forcing it in spite of our preferring not to take that course. But we have paid out since. We start paying those who need it most, the little stores, etc."

The visitors asked where his diesel tractors could be found at work. "Come on with me in the pick-up and I'll find them," Mr. Khan said. After two hours driving around over the flat Sacramento rice lands, we had found his young Cat-skinners on the job plowing and land levelling as they got two different fields in summer fallow and ready for better irrigation practices. The Hindus know their rice from generations of rice farming in their native country. But when you ask them about the Oriental hand work in producing a rice crop by hand sowing, transplanting and harvesting, they smile. They know it only too well, but that is where they break with the past and go diesel instead of walking and bending in the paths of their ancestors. East may have been East, but once it has farmed rice via diesel West, it farms West!



So eager were the Hindu partners, Kalu Khan and Ata Muhammed, to get one of the Hahn and Mehrten diesel-powered one-man bulk combines, they lay down their $25,000 check in advance and got their machine in time for their 1948 rice crop. There are some thirty of these G-M diesel-powered harvesters in the Sacramento Valley rice areas now. Their success in cutting harvest time in half and getting the crop harvested in spite of wet seasons that halted work with all other machines, proved that the diesel job on tracks was "bigger than the weather" as well as economical.



New rice and grain drier with concrete bins at Willows, where Kalu Khan and Ata Muhammed send their rice crop for drying and storage until sold. This is one of some 25 modern drying and storage plants built in the Sacramento and San Joaquin valleys to handle this crop by direct combining to cut costs and increase quality for larger profits. Note International TD14 pulling LeTourneau scraper as it landscapes the site to get it ready for the big diesel trucks—G-M, Mack, Cummins, Buda—that haul the rice from bins to mills at Sacramento, Woodland and San Francisco or the docks at the latter city for export trade. Mobile crane used in erection was also diesel-powered.

High-Speed Diesels . . . Design, Operation & Maintenance

CONDUCTED BY H. G. SMITH

SMOKE ABATEMENT

AMERICAN industry has the reputation of overcoming all kinds of obstacles to its progress, and the diesel engine industry is no exception. It is the writer's opinion, however, that we are facing a situation today, that we are not taking seriously enough, and that is the laws being passed to restrict in certain localities, cities and countries the use of diesel highway equipment because of the offensive smoke from the trucks. Another serious thing is some of the articles appearing in the daily newspapers regarding some situations their reporters have found. We all know the tremendous influence these papers have on public opinion and how they can even influence the various law-making bodies of their community. The writer brought to your attention in the 1949 October issue of DIESEL PROGRESS an article published in a widely circulated middle west newspaper in which they blamed the smoking diesel engine trucks for the haze that blanketed the city at that time. It stated "that some authorities felt that an increasing share of the haze could be attributed to the great number of diesel engine trucks operating with smoke pouring out of the exhaust and covering the streets." It further stated "that the city's smoke inspector was instructing his staff of observers to halt and warn drivers of smoke creating trucks and to report the most flagrant violators to the police. This same newspaper, just a few weeks ago, carried a column and a half article headed with the title, "Diesel Trucks Leave Trail of Fumes and Smoke." The reporter went on to state "you can usually distinguish a diesel truck by its smell. The acrid odor of its exhaust fumes is a little like a leaking oil furnace, only worse. In overtaking one of these oil burning motor freighters, you are lucky if there is a strong cross-wind. The fumes trail behind a diesel for a mile or more. When the engine labors, black smoke chugs from the exhaust. The owners of houses in the outlying districts with picture windows and living near a highway are finding their fresh air and sunshine mixed with diesel fumes."

If we allow these things to continue without taking them seriously, they will lead to grave consequences. In fact, the city in which this newspaper is published owns and operates the city's bus line and just recently purchased over 500 buses equipped with engines to burn butane fuel. Most of their previous equipment was diesel engine equipped. What influence these articles had on the city's fathers' decision to pass up diesel equipped buses would be hard to determine, but putting two and two together it does not look good for our industry. If our industry is to expand, we certainly must not let these things happen if we can help it. We can do something, we know the problem, let us take a more realistic attitude and decide on more drastic measures to overcome this criticism. In my files there are at least a dozen papers or articles, some published in this magazine, covering the cause of smoke and what corrections can be made. Without exception, every writer agrees that the problem would not be with us if all operators would keep their engines in good condition, use the proper fuel and avoid overloading. The majority of operators are proud of their diesel equipment, not only because their operating costs are lower, but their engines are real work horses and produce power that is unobtainable from any other motive power. We should support these good operators and organize some type of campaign to eliminate the few violators who are causing the public authorities to pass restrictive laws and the daily newspapers to publish statements that are poisoning the public's opinions of diesels. It certainly can be assumed that after years of discussion in articles and papers by engineers and the like, publication of actions taken by city officials, warnings issued by newspapers, restrictions being placed on diesel equipped trucks in some communities, we are attacking the problem in the wrong direction when we put all the blame on the operators and drivers.

H. G. Smith's background in diesel engineering renders his articles of great interest to those engaged in operation and maintenance of high-speed engines. From the Springfield, Ohio, Technical and Engineering school, he entered the Foos Gas Engine Company, Springfield and later, Springfield Motor Truck. With this experience behind him, he joined Hercules Motors Corporation, where he was chief engineer for many years being with them when their diesel program was started. Executive engineer for Buda during the last ten years, he recently resigned to take up consulting work.

Because the diesel engine has so much extra potential power, a few operators will try to get every bit out of it, to the detriment of clean operation. It is rugged and will stand a great deal of abuse and for this reason it is frequently neglected. The problem of educating these operators should not be such an insurmountable problem, in fact, since it will definitely affect future sales, the expense of any program could be charged to sales or advertising. As more and more restrictive laws are set up, we will be compelled to take stronger action or face diminishing sales. The industry has its Internal Combustion Institute, where such problems can be safely discussed. It could set up a committee to seriously study the situation and decide upon a definite set of recommendations that all manufacturers would follow. To tell a fellow in strong terms what he can or cannot do with a piece of equipment that he has purchased is reaching out pretty far, but if it is necessary to protect our own bread and butter, it certainly must be close to that kind of an approach. We can, however, be more careful of our claims of super power, more securely seal our fuel delivery limit below the smoke line and put in front of the user all the reasons why they are so firmly sealed. We could protect ourselves by taking a more realistic viewpoint and even reduce our claims somewhat by acknowledging that our diesel engines need care just like an athlete. He submits himself to strict rules if he wants to keep fit, so much the diesel engine be submitted to a strict program of preventive maintenance if one is to benefit by its unusually high percentage of availability. Let us go after these fellows who are giving us such a headache.

DIESEL ENGINE CATALOG is just off the press in its Fifteenth Edition. Completely revised and up-to-date, it is invaluable to design engineers and buyers.

Exchange Your Diesel Maintenance Ideas

CONDUCTED BY R. L. GREGORY

A CASE HISTORY OF AN ANNUAL OVERHAUL JOB ON A LARGE DIESEL

Part 1

HAVING recently overhauled one of our large units, and also having compiled a very concise record of this overhaul, the writer is passing on this information for what it may be worth to some of our readers. The unit in question was completely overhauled in one week's time, having started the job on a Monday morning and having it completed so that the unit was back in service the following Monday, the elapsed outage time of this unit being the six-day operating week.

Figure No. 1 is a copy of the sheet giving the details on No. 4 liner and piston, which shows the cylinder liner wear, since the last inspection, the total cylinder liner wear to date, and the piston ring wear and conditions as we found them on this particular cylinder and piston. Sheets similar to the one shown in Figure 1 were compiled on each liner and piston.

Figure No. 2 is the reverse side of the sheet shown in Figure 1. Here is recorded the data in more detail relative to this liner, piston and cylinder head. Now all this data is concise and easily kept, and it was further augmented by supplementary sheets with additional data, which will be noted further on in this article.

Referring back to Figure 1, you will note that all the physical data on this unit takes up the first part of the sheet. Next the cylinder liner wear since the last inspection. You will note also by referring to the fourth line above, that new liners were installed in this unit in May, 1948. Since that time the unit has actually operated 5,018 hours, since it is used for peak load operation and emergency service. Weekly cards taken from the unit have shown no necessity for the usual annual overhaul on this particular unit, therefore no complete inspection of the unit has been required up to this time.

However, with the winter months before us, an ever increasing demand is being placed upon the plant for energy. With this situation facing us we have deemed it good insurance and protection to make a complete overhaul of the unit. The total liner wear to date, as you will note, is paramount to the cylinder liner wear since the last

Figure 1

Date: September 14 1950

BOARD OF PUBLIC WORKS
HILLSDALE, MICHIGAN

Engine No. 1.

Diesel Engine Liner and Piston Ring Wear

Customer: Municipal Light & Power Plant — Order No. Job 3578
Engine Type: TA-216 — Cylinder No. 4 — Engine No. 31573
Normal Rating: 2250 — B. H. P. 1500 — K. W. at 225 — R. P. M.
Original Liner Bore: 21.000"plus- New liners installed during May-1948
Date Inspection: September 14 1950 — Date Last Inspection: May 1948
Hours Operated Since Last Inspection: 5,018 — Average Load 1100 73%
Lubricating Oil Data: Cylinder Oil Used 6 Gals. per 24 Hours
Corresponding to 9,000 B. H. P. per Gallon
Brand of Oil: Crankcase- Talpa 241, Cylinders-Ursa P-40,Compressor-Ursa-C
Name of Oil Company: Shell & Texaco Companies
Number of Lub. Oil Holes 6 — Top or Bottom Lubrication Top.

Cylinder Liner Wear Since Last Inspection

T.P. - Top Position of Piston Ring Travel
Par - Parallel to Crank Shaft

	Location	Par.	45°	90°	135°	Average	Wear Per 1000 Hours
A.	4" Below Top Pos.	.030	.030	.033	.031	.031	.0062
B.	8" Below Top Pos.	.020	.020	.024	.023	.02175	.00435
C.	3" Above Port	.014	.012	.013	.015	.0135	.0027
D.	3" Below Port	.003	.005	.005	.003	.004	.0008

Remarks: Total average wear of liner per 1000 hours of operation based on a total of 5000 operating hours was .00351

Total Cylinder Liner Wear To Date — Total Hours Operated: Average Load %

	Location	Present Average	Previous Average	Total Wear To Date	Wear Per 1000 Hrs.	Remarks:
A	4" Below Top Pos.	.031	0	.031	.0062	Total average wear of this
B	8" Below Top Pos.	.02175	0	.02175	.00435	liner was .00351, based on
C	3" Above Port	.0135	0	.0135	.0027	1000 hours operation.
D	3" Below Port	.004	0	.004	.0008	

Remarks: Complete details of the overhaul of this liner and piston are recorded on the reverse side of this sheet.

Piston Ring Wear

Ring	Type	Manufacturer	Joint	Installed	Hrs. Oper.	Condition of Rings
1	Plain	Code ABC	Butt	Jan.-50	1200	Collapsed-2" off one end.
2	"	"	"	"	"	" - Little tension.
3	"	"	"	"	"	" - " "
4	"	"	"	"	"	" - " "
5	"	"	"	"	"	" - Some tension
6	"	"	"	"	"	" - " "
7						
W 1		Code-ABC				Good condition.
W 2		"				" "

Remarks: The above piston rings were found unsuitable for further use, as in all instances they had collapsed leaving no tension. The original free gap of 1-3/4" had decreased to 3/4" on the first 4 rings-1" on last 2.

inspection, due to the fact that no inspection has been made since May, 1948. However, on the next inspection these figures will form the basis for determining the liner wear since last inspection.

Turning to Figure 2, the data herein given will explain the discrepancy which seems to be present between hours operated, under piston ring wear and the total operating hours since installation of the new liners. We did pull all pistons in January of this year, but no reading of liner wear was taken at that time, due to the fact that only 3,800 hours had been consumed in operation since the installation of the new liners.

We have always made it a practice to carry two spare liners in our stock of parts. These liners are cleaned up, rerung, and stored with a canvas cover to keep foreign matter from the piston while in storage. You will note that the piston pulled from No. 4 liner on this inspection was the original No. 6 piston which came with the unit, and that the original No. 4 piston was cleaned up and in our stock as a spare at the time of this overhaul. When the inspection was made and the original No. 6 piston which had been installed in No. 4 liner back in May, 1948, it was found that the piston head on No. 6 was badly fire checked and deemed fit for discard since it had been in operation for better than six years. We normally give a life expectancy to these piston heads of five years, even though many of them last much longer, but for depreciation charges we feel that five years is all that we can reasonably expect on an air injection engine and our experience in the past several years has borne us out in this assumption. As a result the piston head from this original No. 6 piston will be discarded and the skirt fitted with a new piston head, chargable out over a five-year period. When this is done and the piston rerung this No. 6 piston will be placed in stock as a spare for future use.

The balance of the data on this page is self explanatory and recorded as a matter of record for perusal on the next overhaul. By so doing there is no guesswork or leaving to memory as to what was done on the recent overhaul. This page then covers in detail the record of this particular liner and piston. However, to make the record of the overhaul complete, the following supplementary data is included on an appendix report, filed with the foregoing sheets.

SUPPLEMENTARY REPORT

General Comments

Supplementing the foregoing sheets which cover the individual liners, pistons and cylinder heads, the following comments are made and data recorded. New liners were installed in this unit in may, 1948. Since that time this unit has been used as a peak load unit and emergency unit and has been in 5,018 actual hours of service. Due to the low number of operating hours since May, 1948, it has not been deemed advisable to go to the expense of a general overhaul. However, after 19 months of operation, or approximately 3,800 hours, and having the time to do so, we did pull all the pistons in January, 1950, to inspect the pistons and rings. At that time the installed rings

Job 3578

COMMENTS IN DETAIL ON NO. 4 LINER, PISTON, ETC.

The piston pulled from No. 4 liner (original No. 6 piston) had been removed from the liner on September 13th. The piston head on the removed piston had been in operation over six years and inspection showed it to be firechecked and unfit for further use. It was therefore removed from the skirt and discarded. A new piston head will be installed on this skirt and the whole rerung and placed in stock as a spare. The original No. 4 piston which had been cleaned up and rerung and was in stock as a spare was installed in No. 4 liner.

CYLINDER HEAD: No. 4 cylinder head was cleaned up and buffed, then inspected for defects. None were found, so it was ready for reinstallation.

PISTON RINGS AS REMOVED: Complete details as to to the condition of the removed rings will be noted on the reverse side of this sheet.

PORTS: Inspection of the intake and exhaust ports were made after the piston was removed. A slight deposit of fluffy carbon was noted, which was easily removed. This condition showed that the fuel purge was active.

LUBE OIL PORTS: After the liner was cleaned, the lubricators were operated and all six lube oil ports gave an ample supply of cylinder oil to the liner.

WIPER ASSEMBLY: This entire assembly with attendant piping from the lubricators, including the check valves in the pipe lines, was removed. The assembly was fairly dirty, as were the pipe lines and check valves. The whole was dismantled, cleaned and inspected, and pipe lines flushed out with steam. New check valves were installed in the pipe lines and the whole reassembled ready for reinstallation. Before reinstallation, No. 4 piston, minus rings, was dropped into position and bolted to the crosshead. Tolerances were then taken beween the piston and liner. It was found that there was .033-inch clearance between the piston and liner on each side of the piston parallel to the shaft, .028-inch between piston and liner on the scavenging side, and .042-inch between piston and liner on the exhaust side. The original clearance in these respective positions were .030-inch, .020-inch and .040-inch. The piston was then removed for reringing and the wiper assembly reinstalled.

LINER. Inspection of the liner showed it to be in good condition with no shoulder having developed at top stroke. Same was then readied for installation of No. 4 piston.

PISTON: The piston was then reinstalled, having been fitted with new rings and bolted in position.

CYLINDER HEAD GASKET: The cylinder head was then reinstalled, using a new cylinder head gasket, and bolted in position. New gaskets were installed on the cooling lines and the whole reassembled for operation.

CYLINDER NO.	A	B	C	D	E	F	G	H
No. 1	.007	.004	.009	.003	.006	.008	.006	.006
No. 2	.004	.007	.010	.003	.008	.008	.007	.007
No. 3	.003	.010	.009	.004	.008	.009	.007	.007
No. 4	.012	.003	.006	.007	.008	.008	.006	.006
No. 5	.011	.006	.010	.003	.008	.009	.007	.007
No. 6	.007	.006	.013	.002	.009	.009	.007	.006

Crosshead as seen from the back with crank at 90 degrees.

COMPRESSOR CROSSHEAD PIN CLEARANCE—.007.

The balance of this overhaul report will be finished in the next issue of DIESEL PROGRESS.

Figure 2

were found to be in very good condition, with only a short end broken off of each of three rings, each ring being in a different piston and ironically all in one of the lower grooves, and in the same groove. The balance of the rings held their tension, there was a no lessening of the free gap and all rings with the exception of those with broken ends were still serviceable.

However, we had purchased several sets of different type rings which we were desirous of trying, so we cleaned up all pistons and installed the new rings for trial use, putting those removed in stock for emergency use. These rings were the ones removed at the last inspection and from results obtained it was decided that they were unfit for our use.

Lube Oil Sump and Pump Drive

Recently it had been noted that there was a seepage of lube oil at the joint between the engine base and the sump tank. With the crankcase drained and the sump empty, we investigated this seepage and found that a piece of the gasket material at this joint had become deteriorated and was allowing oil to seep out and run down the side of the sump tank. In the erection of this unit the sump tank had been fully grouted in, so there was no way of dropping it down and installing a new gasket. However, the bolts were loosened and gave us just enough room to scrape and clean the joint. We then took glyptol and shot it into the opening with compressed air, following this up with a layer of asbestos cord. Several alternating shots of glyptol and cord were packed into the joint and chaulked in with a thin chaulking tool. Then the bolts were retightened with an eventual stoppage of the leak. The lube oil pump and chain drive were inspected and found satisfactory.

CHECKING TOLERANCES

With all pistons reinstalled, cylinder heads in place and the upper part of the engine reassembled our next job was the checking of all tolerances. This was done and the results recorded as follows:

Main Bearings

	No. 1	No. 2	No. 3	No. 4	No. 5
Forward	.009	.013	.011	.008	.009
Aft	*	.011	.010	.009	.009
		No. 6	No. 7	No. 8	No. 9
Forward		.010	.009	.014	.015
Aft		.011	.010	.014	*

* The aft clearances on No. 1 and No. 9 omitted because of inaccessibility.

Rod Bearings

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Forward	.011	.009	.020	.011	.007	.009
Aft	.010	.008	.019	.011	.008	.010

Compressor crank clearance .005.

Wrist Pin Bearings

No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
.0155	.012	.013	.0185	.0165	.0165

From the foregoing it will be noted that all bearing tolerances are satisfactory. At the time new

. . . and now please turn to page 72 . . .

DIESEL ENGINE PROSPECTS EXCELLENT IN A MILITARY ECONOMY

Mr. Andrews is Editor Future Rating Department of Sales Management and One of the Really Brilliant Economists of Today. He Forecasts an Encouraging Year of Sales for 1951 for Our Entire Diesel Industry

By PETER B. B. ANDREWS

THE diesel engine industry is one of those fortunate industries that enjoys a favorable prospect in war or peace. That is because it is a youthful, "growth" industry, ever-effective in lowering costs of operation and increasing efficiency—a desirable objective in peacetime and an essential one in time of war and its inevitable stringencies of labor and material shortages. In previous issues of DIESEL PROGRESS, the writer and his 300-man board of future-sales ratings associates have estimated an underlying backlog of orders exceeding $3,500,000,000—enough to keep the industry booming far past the next decade. Of course, not all this is ready demand; the backlog includes potential orders where a good deal of selling and promotion are required to translate the basic desire into an order. The prospective economy of the nation points to a period of heavy demand for diesels with new sales records contingent largely on the question of availability of materials for manufacturers. However, with the rise of the military economy and its attendant demands for national production at capacity, the fundamental importance of the diesel engine industry becomes even more evidence because of the production impetus it places behind such vital industries as railroads, trucking and other transportation, farming, construction, shipping, petroleum production, logging, road building, basic industrial power, mining, irrigation, quarrying, and central and municipal utility plants.

Therefore, any allocation cutbacks which may transpire over the next twelve months are less likely to apply as heavily to diesel engines as to the majority of durable goods lines. As matters stand, in fact, most fields of diesel engines usage should be sold more diesel engines than was the case in recent years, including 1950. In the backbone field of railroad transportation, dieselization is moving rapidly and the tempo should be stepped up further in the war economy. Diesel-electric locomotive units installed in 1948 totaled 2,299 units; in 1949 they totaled 2,755 units; and in 1950 they will total about 3,000 units, with 3,500 possible for 1951. There are now over 12,500 diesel units in service among the nation's railroads; 40 per cent of the nation's freight tonnage and 50 per cent of passenger traffic rolls behind the more efficient diesels, compared with only 1 per cent and 8 per cent back in 1941. Some railroads have been letting their steam locomotive maintenance lag and accordingly are confronted either with expensive repairs or the acquisition of new diesels. The economy aspects of the diesels and the relative ease of financing them make strong sales arguments. Any potential buyer purchases more when his financial condition is good; in this respect the railroad's finances are in the best shape since before the depression of the early '30's. This fact, along with the great desirability of dieselization to cut high operating costs, will continue to stimulate interest in the months ahead. The old Erie Railroad, once on its back financially, is one of the latest roads to aim for virtually complete dieselization. Paul Johnston, the president, smiles when he talks of the happy objective of adding 57 diesel locomotives and facilities. "This move," says Paul, "makes the Erie one of the leaders in the utilization of diesels among the major Eastern railroads. With the exception of the New Jersey suburban service, which will be about 50 per cent diesel-equipped, passenger service will be 100 per cent dieselized.

Shipping represents another backbone line in a defense or war economy. As to diesel-propelled vessels, in 1948 there were 102 diesel-propelled vessels built, which measured over 100 gross tons and were classified by the American Bureau of Shipping. These vessels had installed in them diesel-propelled machinery totaling 117,247 horsepower. In 1949, the figure was 89 ships and 99,847 horsepower. Up to June 30, 1950, there were 18 ships built using a total of 19,215 horsepower. There were also 71 vessels under contract and they were due to have a total of 54,205 horsepower of diesel-propelling machinery installed in them. The prospects are for a substantial pickup in this field. For 1951 installations are expected to rise to at least 125,000 horsepower of machinery in more than 100 diesel-propelled vessels likely to be built. Highly essential in the fueling field is the petroleum industry, with its importance growing even more essential in times of war. This industry bought about 3,200 diesel engines for various purposes in 1948, about 3,400 in 1949, and is likely to buy some 3,700 before the year-end 1950, with a prospect of about 4,000 in 1951. Another extremely vital industry which has the green light on production is agriculture, and the future looks promising for sales expansion in that field. In 1948 about 65,000 diesel engines were sold for farming, with a rise to 67,000 in 1949. The 1950 total is likely to approximate 70,000, with 75,000 a possibility for 1951.

Other important diesel fields promise further growth; for example, truck diesel engines sold totaled 8,200 in 1948, 8,400 in 1949, and should total about 9,200 this year and about 10,000 in 1951. Diesel buses are being sold at the rate of about 2,000 per year and the total of diesel buses in service in 1951 is approximately 18,500. Central and municipal plants will want a minimum of 400 diesel engines, compared with 345 in 1950, 305 in 1949 and 280 in 1948. These estimates assume

the fundamental point that the diesel engine manufacturing industry will be able to get adequate raw materials. In a fractional war economy, the writer believes there is little doubt of this, and even in much heavier mobilization this industry is entitled to a high-preference status because of its importance to basic industries on which the war economy moves. All-out allocations of the World War II type appear to the writer only a distant possibility, with the situation as it is now and is likely to develop. The present situation does not call for such allocation, and it is not at all comparable with that of World War II. Only a few months after we entered that war, 50 per cent of our total industrial effort was going into military production. Now, only a small part of the country's large manufacturing capacity is going into war goods. And, that capacity has been built up greatly since the end of the last war. American manufacturing capacity is now at least 50 per cent greater than it was 10 years ago, and recently we have been producing goods at a rate 60 per cent higher than in 1940. It is significant to observe that over $18,000,000,000 went into expenditures for new plant and equipment in this country during the year 1949, over $19,000,000,000 in 1948, over $16,000,000,000 in 1947 and about $12,000,000,000 in 1946. This represents a tremendous expansion of productive facilities. By comparison, expenditures for new plant and equipment in 1940 totaled $6,500,000,000; in 1939 they were $5,200,000,000, and in 1938 they totaled $4,500,000,000. We are a far bigger, and by reason of vast expansion into more modern plant in recent years, a much more efficient nation of industrial production than we were a decade ago.

Considering the size of our modern plant, it is believed that the military goods now called for can be produced with ease and with a leeway still permitting an output of civilian products not far from the level of recent years. At the moment, we are turning out war goods at the rate of about $15,000,000,000 annually, and the current goal of the fractional war economy is about $28,000,000,000, or only 10 per cent of the gross national product of the country, now running at the rate of about $280,000,000,000 annually. Gross national product is the market value of the output of gods and services produced by the nation's economy. It may be noted that gross national product in a good year like 1947 totaled $231,600,000,000, or almost $50,000,000,000 less than the current annual rate! This difference is not far from double the present projected annual rate for military expenditures. Naturally, there will be some sacrifices, even under the present program, as production for the military rises, with some resultant deflationary effect on production of civilian goods. But the basic diesel engine industry is less likely to decrease than many other lines, reflecting its essentiality in a high-production military economy. Automobiles, now at the tremendous annual production rate of 8,500,000 cars, may decline to about a 5,000,000 rate—though that would be more because of a manpower shortage than because of a steel shortage—still a tremendous rate by comparison with past years. Refrigerators may recede from the present annual rate of 6,000,000 down to about 4,000,000 units, washing machines from 5,000,000 to 3,000,000, vacuum cleaners from 3,500,000 to 2,300,000, and trucks from 1,500,000 to 1,000,000, to give a few examples of potential release of materials. These potential production rates for the future, however, are still at prosperity levels. In fact, with the production facilities the country has now, there are enough materials for both a booming civilian economy and fulfillment of the current war schedule.

In steel, for example, one of the most essential of war materials, capacity has been expanded beyond 100,000,000 tons annually, a jump of 18,000,000 tons since 1939. The *maximum* needs of the present war schedule are only 6,000,000 tons. Stockpiling, moreover, has progressed to the point in critical metals where we now have an estimated 70 per cent of the copper requirements, 100 per cent of the aluminum requirements, 80 per cent of the zinc requirements, 75 per cent of the manganese requirements, 55 per cent of the lead requirements and 50 per cent of the tin requirements necessary for the conduct of the Far Eastern War as now anticipated. Significant, too, is the fact that productivity of our nation's plants, as well as capacity, is rising and will rise further. In steel, for example, there are 6,000,000 additional tons of capacity under construction, on top of the record-breaking plant now existing. Furthermore, if various non-essential civilian lines are cut back to levels that now appear possible, there would be a saving of at least 20,000,000 additional tons. In spite of improved productivity, there is still some slack in the nation's producing ability ,and the patriotic urge is bound to improve that. Even without an increase in the labor force or in hours of work, the present material and human resources of the economy are sufficient to lift the nation's total production by the end of 1950 to an annual rate some $10,000,000,000 above the current rate, with further gains to be anticipated in 1951 and succeeding years, to reach an immense goal of $350,000,000,000 in gross national product, or about $70,000,000,000 over the present annual rate. War-scare buying and inventory-hoarding have tended to rock the economic boat, but Washington now has powers to crack down hard on hoarders, and to emphasize these powers, examples are sure to be made of some offenders. Nothing official has been done as yet to take away the excess in some inventories, but, as in the early stages of World War II, such inventories of critical materials are likely to be exposed and surplus holdings reduced. The writer discovered during his association with the War Production Board through the four years of World War II that the very large majority of businessmen are highly cooperative in sacrifices for the war effort; nevertheless, there always seems to be a small, tough core of uncooperative people who must constantly be watched and punished to bring about a more equitable distribution of materials for all. If unfair distribution of materials and goods should get out of hand, then full-scale rationing and price controls would be used, even in a semi-war economy. Such controls often hit some people inequitably, because of the base period used in determining quotas or because of special work being done. In such cases, we were always glad to listen to appeals for extra materials, and granted those that were legitimate and justified. Many misunderstandings and undue fears arose on controls and appeals in World War II days, but businessmen discovered the Government reasonable if it fully understands a situation.

Regardless of whether the war is fractional or full-scale, or if there is simply a defense economy, the diesel engine industry is likely to spend heavily for advertising, in the writer's opinion. Earnings of this industry in any case are likely to be good, even with heavy conversion to the war effort, thus encouraging large advertising expenditures. The writer remembers well the experience of the last war when diesel engine companies' advertising dipped temporarily and then soared on to new heights. This time it would be unlikely even to dip, for the memory of how war stimulates advertising, including heavy and effective advertising by the competition, still is fresh in the industry's minds. Now, just as in the days of World War II, there is unwarranted concern among some people about what the Government may think of industrial advertising expenditures as a logical business expense before taxes, or whether or not the Government will attempt in some other way to control advertising. For many years our nation has had a stimulated economy, and advertising has been the great stimulator. It is recognized that a time of emergency such as the present needs more than ever the spark which energizes American business. Advertising, therefore, will be considered by the Treasury Department as a legitimate expense deductible before taxes. New taxes, moreover, are likely to stimulate increases in advertising expenditures, since reasonable expenditures in the military economy will be considered deductible before taxes. Not only will the recent rise in corporation taxes from 38 per cent to 45 per cent for 1951 have this effect, but a great additional stimulant to industrial advertising would arise from the proposed excess profits tax, which to the writer looks inevitable for 1951, unless there is a miraculous turn in the war trend. The diesel industry had a top, five-star rating before the war; in the military economy it continues to rate five stars on its sales outlook, which means demand for diesel equipment in the months ahead.

Top-ranking sales forecaster Peter B. B. Andrews has a high batting average of success over a long period of years. Editor and Economist of Standard Statistics Company, Dr. Andrews also conducted for *Sales Management* over the last 15 years the Future Sales Ratings surveys for the 100 leading industries of the country, with a remarkable record of 84 per cent accuracy. He was called to Washington by Gen. William S. Knudsen in 1941 to serve as an economic adviser in Government departments. He has done marketing studies for some of the country's top companies, and in the past 20 years has written many economic articles for the leading magazines of the nation. Currently he is economic adviser to the National Distribution Council of the Department of Commerce, standby economic adviser to the National Security Resources Board, editor of Future Sales Ratings, consulting economist to *Sales Management* magazine, and advisory economist in several private enterprises.

DIESEL ENGINE CATALOG is just off the press in its Fifteenth Edition. Completely revised and up-to-date, it is invaluable to design engineers and buyers.

OPERATION OF SUPERIOR DUAL FUEL ENGINES

First of a Series Devoted to Detailed Instructions on the Operation of Specific Dual Fuel Engines

SUPERIOR dual fuel engines are basically the same as the standard Superior diesel engines. They operate on the same high compression auto ignition cycle with high thermal efficiency, using the same main parts such as pistons, cylinder heads, fuel oil injection system, etc. The chief differences are in governing and gas admission, which will be described later. The reason for successful operation of these engines, in which gaseous fuel is admitted into the cylinder during the intake stroke and compressed to 400 lbs. per sq. in. or more, is the fact that very lean mixtures of dry gases, i.e., those that are properly rid of the liquid vapors of casing head gas, will not ignite spontaneously at such compression pressure and temperature. Some additional form of heat must be supplied in order to initiate combustion. This is the reason for the injection of a small amount of fuel oil which ignites readily under compression temperatures when properly vaporized. To repeat, the main fuel is gaseous and is supplied to the cylinder during the air intake period in quantity proportional to engine loading. The resulting mixture is compressed and is then ignited or "fired" by a pilot charge of fuel oil which is injected at the proper time by the fuel injection system. (The injection system is also capable of carrying 100 per cent load on diesel oil if desired.) The pilot fuel quantity required depends to a considerable extent upon the application of the engine and may vary between 5 per cent and 18 per cent of the total fuel oil required for full load diesel operation.

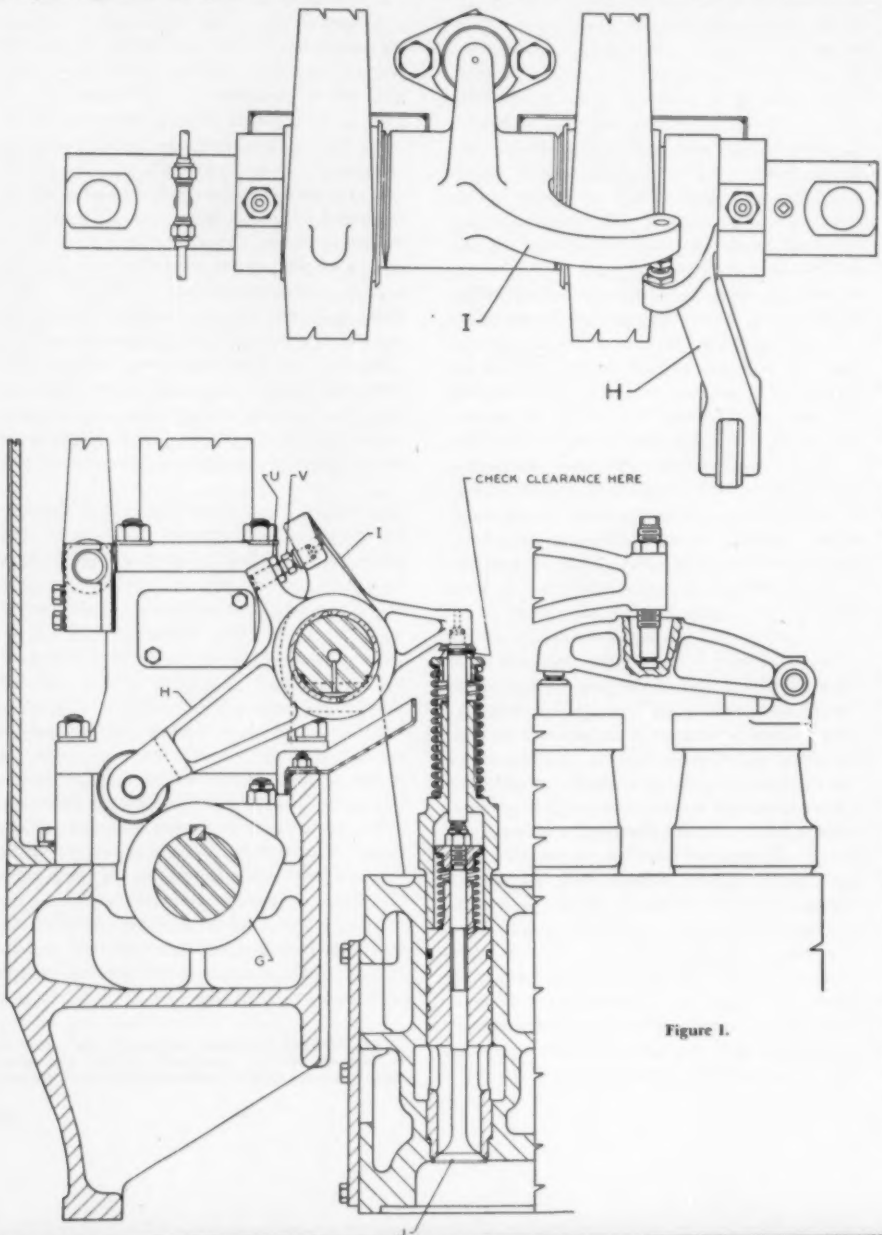


Figure 1.

These dual fuel engines may be separated into two general classifications. One includes engines of the portable type used principally for drilling oil wells. These are usually equipped with mechanical governors especially developed for the variable speed operation required for their application. In the other classification are stationary engines, used for such services as electric power generation and pipe line pumping. Such engines usually run at constant speeds and are equipped appropriately with hydraulic isochronous governors. In each case the controls for gas and fuel oil are specifically designed to suit the governing system employed.

Again, these engines may be divided into two groups, naturally aspirated and supercharged. There are marked differences in the methods of admitting gas to the cylinders of the two types. In naturally aspirated engines the suction created by the intake of air is used to draw in the gas. This is not practical for a supercharged engine because a portion of the air supplied by the blower is passed through the cylinder to effect thorough scavenging of burned gases and to cool the valves and combustion chamber walls. (During a period of approximately 150-degree crank rotation both inlet and exhaust valves are open.) This scavenging air would carry some of the fuel gas into the exhaust, with the result that the apparent gas consumption would be unduly high.

In order to avoid this undesirable condition the gas is admitted directly into the cylinder through a valve timed to open when the exhaust valve closes and to close when the intake valve closes. In Superior supercharged dual fuel engines the air starting system is adapted to be used as a gas distributing system, using the starting air check valve (in the cylinder head) as a gas admission valve. This requires an extra cam as well as additional valve gear for each cylinder. The gas pressure is not great enough to overcome the springs which hold the air starting valves (operated by the air starting cams) open when the starting air is off, and therefore these valves do not obstruct the flow of gas. A typical arrangement of this sort is shown in Figs. 1 and 2, which illustrate an engine with an overhead camshaft. A powerful helper spring is used to overcome inertia of the rocker arm, the valve (J) itself being returned to its seat by a relatively light spring which can be overcome during starting by the

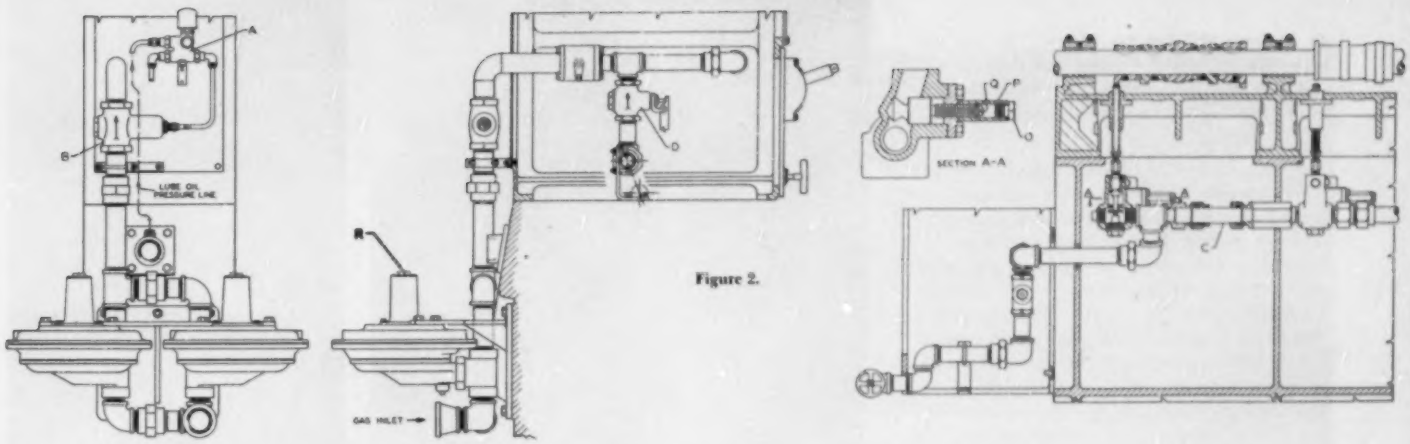


Figure 2.

high pressure air. Controls are arranged to cut off the gas when the engine is stopped and to preclude any possibility of both gas and starting air being turned on at the same time.

The following instructions are intended to cover engines which are considered standard types, using natural gas as a fuel. There have been a few "tailor made" installations for the use of other fuels (e.g., producer gas) but these require special consideration.

Naturally Aspirated Drilling Engines—Figure 3 shows a type PTD-6 drilling engine with dual fuel equipment, some elements of which are indicated by letter as follows: (A) Manifold for air filters; (B) Gas carburetor and gas throttling valve linked to governor; (C) Main gas jet (adjust on full load or when hoisting); (D) Idling jet; (E) Gas shut-off valve controlled by lube oil pressure; (F) Crankcase explosion pressure relief gaskets. A 2-inch gas shut-off cock or valve for manual opening or closing is not shown in the illustration, but should be installed by the customer underneath valve (E).

Figure 4 illustrates the back-fire relief valve (H) in the end cover plate of the intake manifold and the air by-pass (I) which should be open in "Oil" position when running on 100 per cent oil fuel and must be closed by moving to "Gas" position for operation on gas. Figures 5 and 6 show the control box on the operating side of the engine. In Figure 6 the cover has been removed.

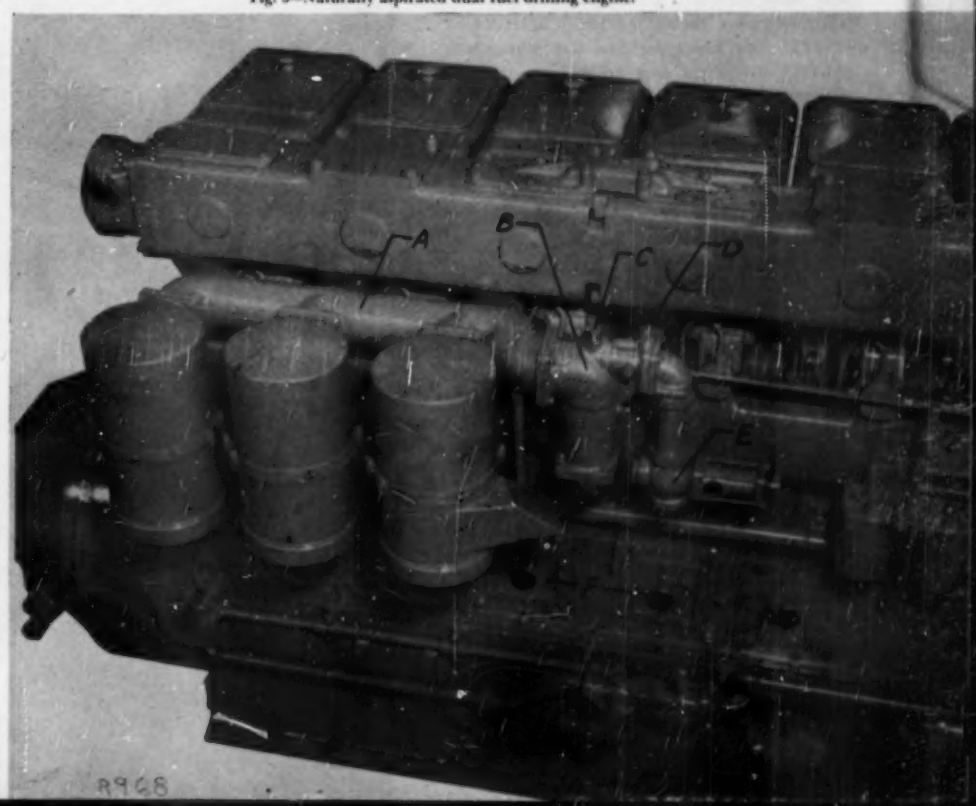
A 2-inch Fisher type 730-H gas regulator, without spring or spring seats, is furnished with the dual fuel equipment for each engine. In addition to this, if the line pressure can at any time exceed 25 lb. per sq. in., the customer should install a regulator to reduce the supply pressure to this valve. One primary regulator of proper size can serve all engines on one rig. A suitable volume tank may be placed between this regulator and the engine regulators. The engine regulator should be located close to the engine and piped direct to the engine with a short run of 2-inch pipe. No volume tank should be used at the engine. The above equipment is based on natural gas of approximately 1,000 Btu. per cu. ft. heat value. A smaller orifice may be required in the engine regulator for gas of considerably higher heat value.

Instructions to Start, Run and Stop—See Fig. 5. To start the engine, place the governor control lever (1) in running position and move the control box lever (2) to "Start." (Starting is on oil fuel only.) When the engine fires bring the lever back to "Oil" position and warm up the engine. After warm-up, the control lever (2) may be moved to the "Gas" position (assuming gas to be available). At the same time the air by-pass lever must be moved from "Oil" to "Gas." Moving the control lever to "Gas" simultaneously limits fuel oil injection to the pilot fuel quantity and admits lubricating oil pressure to the cylinder of the hydraulic gas shut-off valve (E), Fig. 3, to turn on the flow of gas. Oil is admitted to or bled from this valve through a pilot valve plunger actuated by a cam on the control lever shaft. The hydraulic valve is spring loaded and closes automatically to shut off the gas when the lubricating oil pressure is released, either by returning the control lever to "Oil" or by stopping the engine. To stop the engine move the governor lever (1) to its lowest position. At the same time move the control lever (2) and the air by-pass lever (I), Fig. 4, to "Oil" positions.

Adjustments—(1) Nozzle adjustment: Set opening pressure to 2,500 lb./sq. in. (2) Pilot oil adjustment: Equalize exhaust temperatures at 400 rpm. no load with water temperature 140°F. or higher. Remove control box cover (see Fig. 6) and set pilot oil adjustment (5) so injection pump racks read about ½ mm. less on "Gas" than on "Oil" operation with engine idling. (3) Idling gas jet adjustment: Open idling jet (D) approximately 1 to 4 turns. Adjust to match dual fuel idling speed to diesel idling speed. (4) Main gas jet adjustment: Open main jet (C) approximately 4 to 8 turns. Check adjustment on approximately full load. Adjustment should be such that engine speed will be practically the same when switching from "Gas" to "Oil" or vice versa.

Changes in the quality of the gas available (as when the engine is moved to a new field) may necessitate readjustment of the gas jets. The settings of the pump racks should be checked occasionally and if necessary readjusted according to Step 2 above. Dual fuel equipment for the PTD-8 engine is similar to that used on the PTD-6, the chief difference being that the PTD-8 has two

Fig. 3—Naturally aspirated dual fuel drilling engine.



air by-passes and two gas mixers. The two gas butterflies are linked together and must be adjusted so that they operate in unison. The jets in the two mixers should be adjusted alike.

Supercharged Drilling Engine—Figure 7 shows the PTDS-8 engine equipped for dual fuel operation. Instead of a mixer, this engine employs the gas injection method described in the early part of this article. The control box and gas shut-off valve are much the same as those used on the naturally aspirated engine. In addition the control box contains a hydraulic acceleration element which gives a brief increase in pilot oil when the throttle is opened suddenly. In place of the main gas jet screw, the gas valve contains a limiting screw (F) which is adjusted to limit the top speed of the engine under load. A special gas regulator is carried as part of the engine. This is connected to the intake manifold and automatically varies the gas supply pressure according to supercharging pressure. Gas must be delivered to the engine regulator at a pressure 15 to 25 lbs. per sq. in. This may require that the operator install a suitable regulator to reduce the line pressure. One such regulator, when of proper size, will serve all of the engines on a rig. Operation of the supercharged engine, once adjustments have been properly made, is conducted in the same manner as for the naturally aspirated engine, with the one exception that there is no air by-pass.

Adjustments— (1) Nozzle adjustment: Opening pressure 3,000 lb./sq. in. (2) Pilot oil adjustment: Same as for naturally aspirated engine except that exhaust temperatures should be equalized at 500 rpm. Minimum pilot oil settings at any one cylinder should be 6 mm. for Bosch injection pumps and 7 mm. for Demco pumps. (3) Gas metering adjustment: Adjust the gas metering screw (F), Fig. 7, on approximately full load. Adjustment should be such that the engine speed will be practically the same when switching from "Gas" to "Oil" or vice versa. (4) Injection pump timing: Injection pump timing for diesel operation is 12°BTC. The timing for dual fuel operation is 6°BTC. Adjustment must be made by retiming the camshaft at the drive sprocket. (5) Hydraulic acceleration element: Keep this filled with oil at all times to insure good acceleration. Use oil of the same viscosity as is used in the crankcase. Correct level is ¾-inch from the top. (6) Gas injection valve tappet clearance: Check this with a feeler between the rocker arm and the push rod above the valve. Correct clearance is .018-inch.

Naturally Aspirated Stationary Engines—The two types which are most popular for stationary applications are the Model 60 (12x15) and the Model 80 (14½x20). Operation of the dual fuel equipment of these two is described in the following text. While the two models differ in some respects, the dual fuel equipment is basically the same. A spring-loaded gas pressure regulating valve must be installed in the line and set to regulate delivery pressure at approximately 1.75 to 2.5 ounces per sq. in. (3 to 4.3 inches of water), depending on full load and speed of the engine. These figures are based on natural gas of approximately 1,000 Btu. per cubic foot heating value.

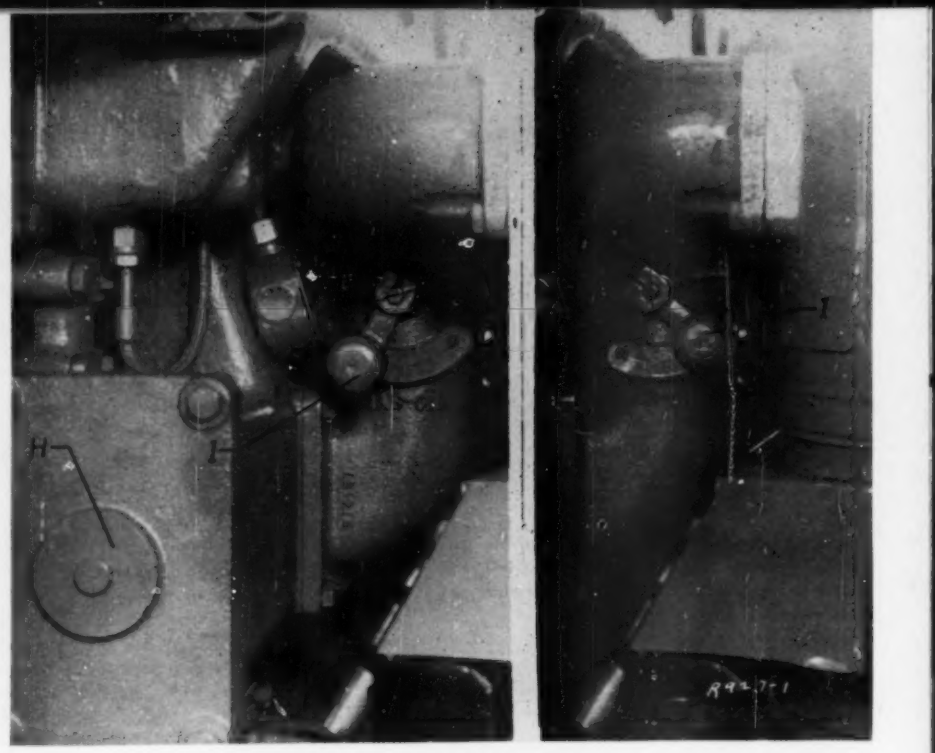
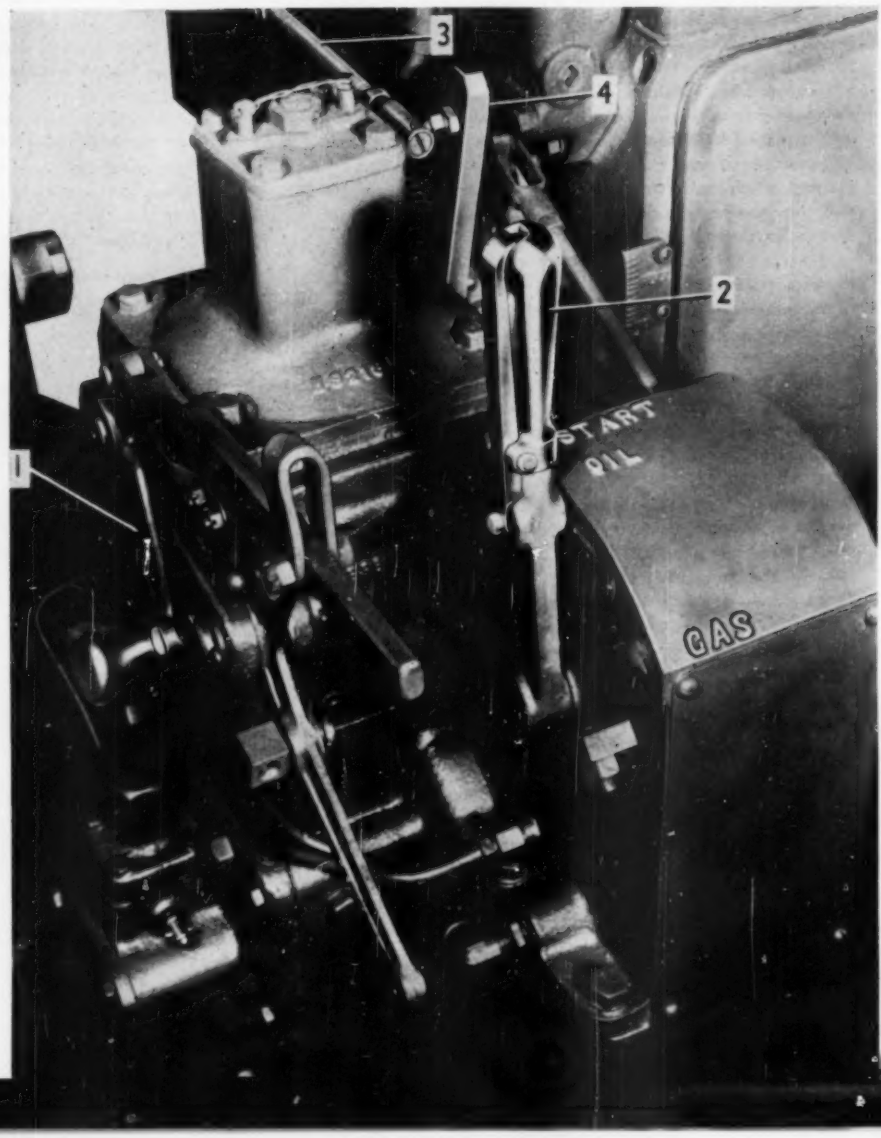


Fig. 4—Air by-pass and backfire valve.

Fig. 5—Dual fuel controls for drilling engine.



Starting and Operating—The dual fuel engine is started and stopped in exactly the same manner as the standard diesel engine by means of the "Stop" handle and the air starting pull handle. The dual fuel controls are so arranged that the use of standard engine controls automatically sets the engine for starting and running on oil fuel only. The dual fuel control panel carries two push button and indicator light assemblies. One push button is marked "Oil" and has an amber indicator light; the other push button is marked "Gas" and is mounted in conjunction with a white indicator light. These push button controls are tied in with the automatic alarm and safety system through a series of electrical switches and relays in such manner as to properly actuate the gas shut-off solenoid valve; thus the desired action is obtained without manual attention other than pushing the proper button on the control panel. When the engine is started, the amber light will glow, indicating that the engine is operating on oil fuel only.

To change over to dual fuel operation, depress the "Gas" push button and move the dial cock handle to open position. Immediately the white light will glow, indicating that the controls are set for dual fuel operation. The amber light will continue to glow for the short time it takes the gas to flow from the dial cock to the engine and further until the governor regulates the gas flow and reduces oil fuel injection to the quantity necessary for pilot ignition of the gas. When this point is reached, the amber light will go out and only the white light will continue to glow, indicating that the engine is operating as a dual fuel engine with only minimum pilot oil fuel injection.

The gas is admitted into each intake elbow through lightweight plate valves which are held closed by light springs and opened by the suction created by the flow of air into the individual cylinders. Figure 8 shows the gas admission system of the Model 60 engine. The first half of the governor stroke is devoted entirely to gas operation and the second half to diesel operation. During the first half of governor travel (gas operation) a spring loaded slip linkage holds the fuel pump racks in pilot oil position, and the governor regulates the position of the gas butterfly valve commensurable to engine loading. As the governor reaches half travel, the spring slip link bottoms, and the fuel pump racks are moved to increase the amount of fuel injected, while the gas butterfly valve is allowed to over-travel. Thus if gas is not available to the engine, or if the supply is insufficient for engine loading, the governor will permit burning of any available gas and will automatically make up the balance of fuel requirements through additional fuel injection above pilot oil quantity. If such action occurs the amber light on the dual fuel control panel will glow, indicating that the engine is consuming fuel oil in excess of normal pilot oil requirements. If the engine load is then reduced, or if the gas supply is increased beyond load requirements, oil fuel injection will be reduced to the pilot ignition quantity and the amber light will go out.

In most of the naturally aspirated engines a cam is provided in the rack control mechanism to vary

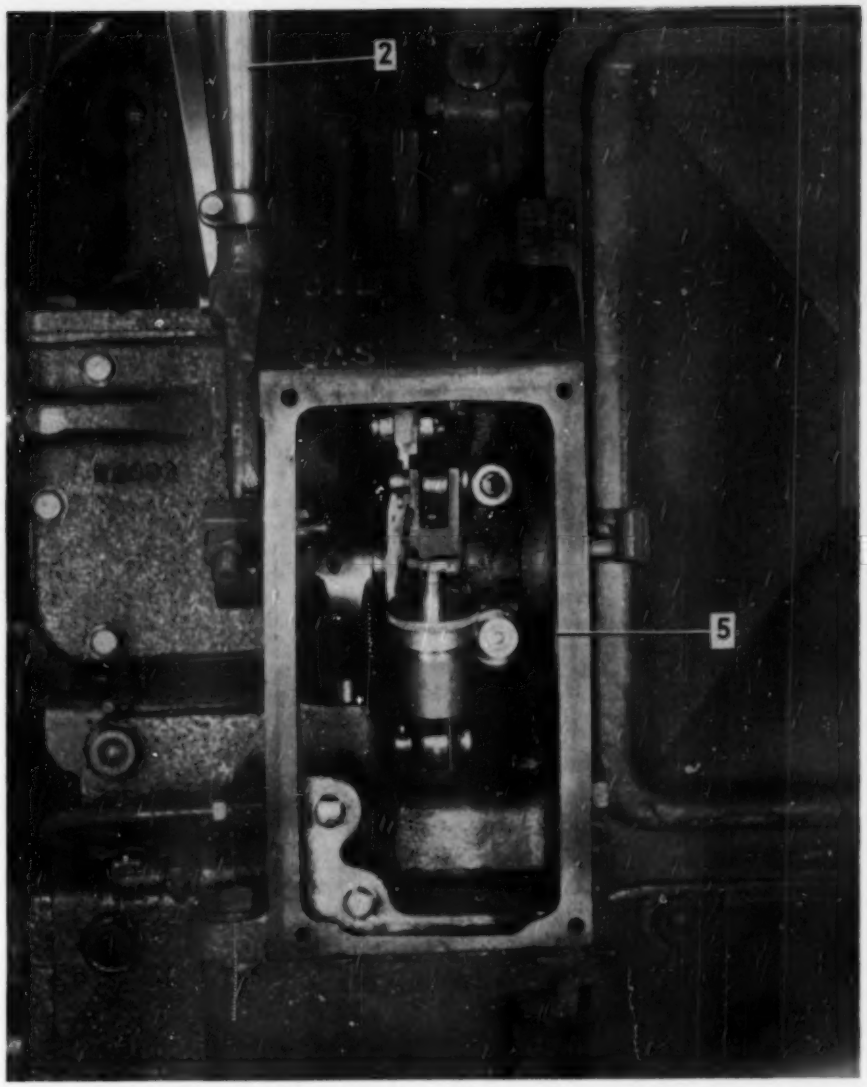
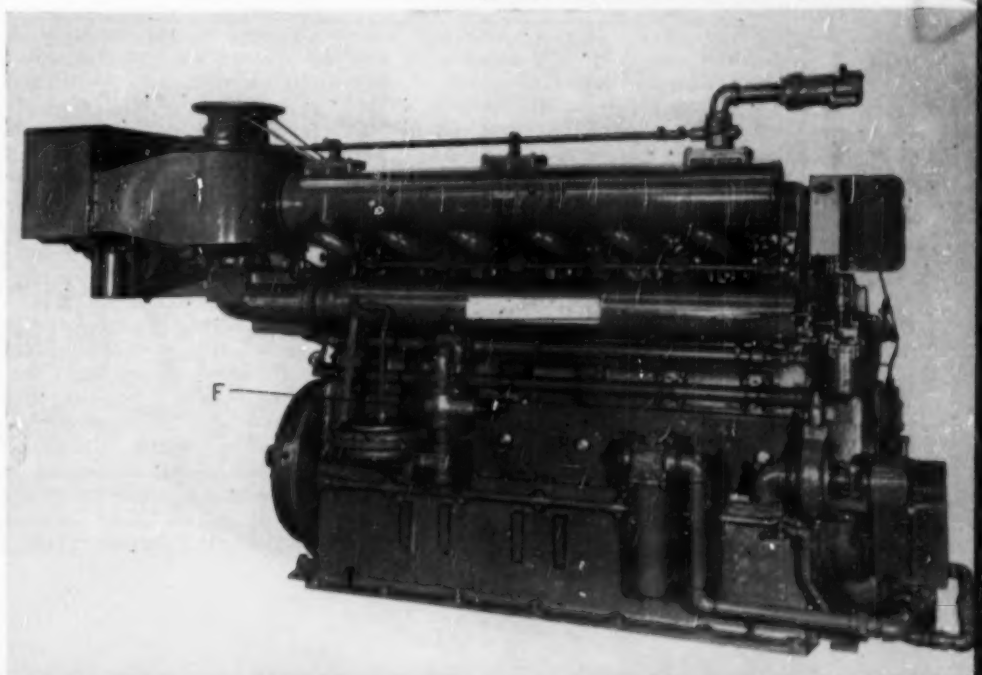


Fig. 6—Dual fuel control box for drilling engine.

Fig. 7—Supercharged dual fuel drilling engine.



the pilot oil inversely with load. When operating on dual fuel, better overall efficiency and performance are obtained if the pilot oil is slightly increased at light loading, to provide better ignition of the very lean mixtures existing under such conditions. If, for any reason, it is desired to operate on less than full load gas requirements, the graduated stop cock in the gas supply line may be set to allow only the desired percentage of maximum gas flow and the engine will continue to operate, with the balance of fuel required by the engine loading being made up by additional oil fuel injection. To change back from dual fuel operation to diesel operation it is only necessary to depress the "Oil" push button on the control panel. A special hydraulic element is also provided to furnish a temporary increase of oil fuel injection for stabilizing action during sudden load application or when changing from gas to oil.

The engine may be stopped at any time by moving the standard control handle to "Stop" position. When running on oil fuel, such action causes reduction of fuel injection to zero. When running on dual fuel, moving this handle to "Stop" position also causes the solenoid operated gas shut-off valve to close and remain closed. If the engine is stopped for any reason through action of the safety stop mechanism, the solenoid operated gas shut-off valve will also be closed.

Adjustments—A special fuel adjusting technique is required for engines of this type. The pump racks, instead of being set for full load diesel operation, must be adjusted to level the exhaust temperatures at no load. Generally the pilot oil rack position for new pumps will be 5 to 6 mm. for the Model 60 and 9 to 10 mm. for the Model 80. The racks may be adjusted individually by screws in the individual control shaft levers. The pilot oil for gas operation must always be slightly less than the idling quantity for diesel operation on a hot engine or the engine will overspeed at no load, especially when shifted to gas. The gas is first turned on while the engine is under approximately one-half load and the exhaust temperatures are equalized by means of proportioning valves provided at each cylinder in the passage from the gas manifold to the air intake manifold elbows. Adjustment is made by loosening the lock nut and screwing the valve inward to decrease, or outward to increase the gas flow. Adjustment should be started with all the valves wide open and the flow of gas to those cylinders with highest exhaust temperatures should be partially cut off. Further adjustments are made at three-quarter load and final adjustments at full load. The gas pressure should be so adjusted that at full load and speed, the governor is just about ready to move into the diesel range

Supercharged Stationary Engines—Supercharged stationary engines use the gas injection system illustrated in Figs. 1 and 2. Special gas pressure regulators are provided and mounted directly on the engine. These vary the pressure to the engine cylinders in accordance with load. Most of the supercharged engines are equipped with air throttling systems, such as is shown by Fig. 9, to give improved economy at fractional loads. The air butterfly (K) is placed between the supercharger outlet and the intake manifold and is actuated through the medium of a hydraulic servimechanism or "booster" (L) to avoid overloading the governor. Supercharged engines are equipped with the hydraulic stabilizing element supplied for naturally aspirated engines. A gas pressure regulator must be installed in the supply line to the engine and set to regulate delivery pressure at approximately 15 lbs. per sq. in. This is in addition to the specially built regulators which are supplied as part of the engine.

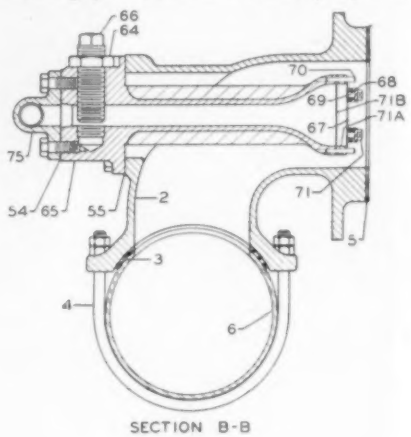
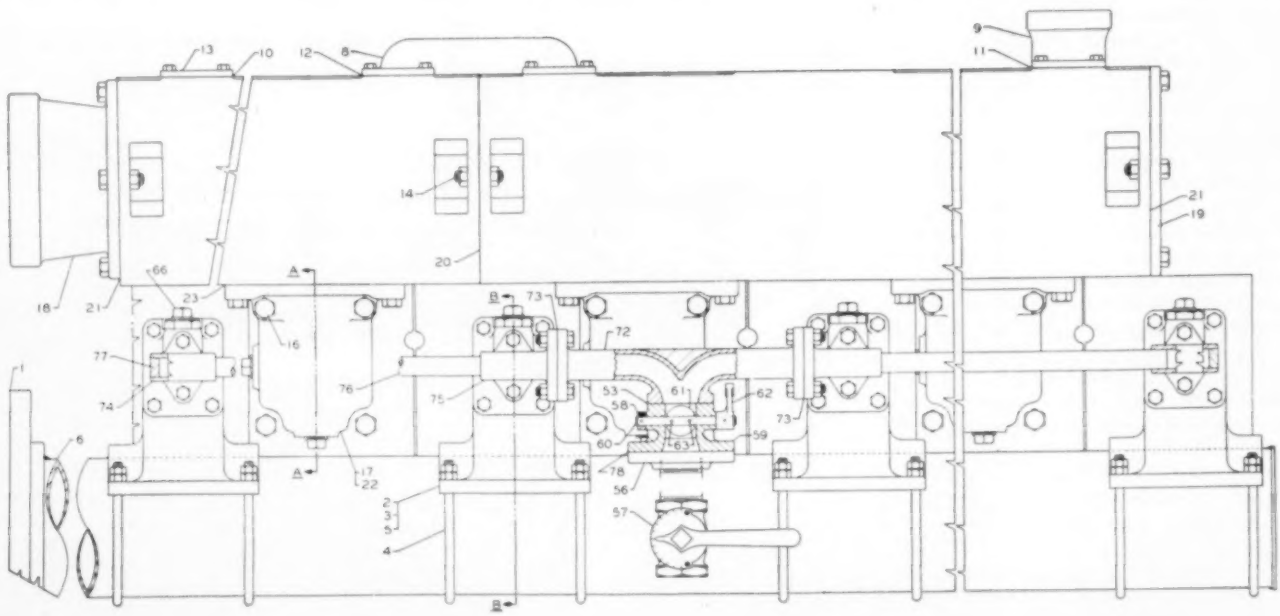


Fig. 8—Gas admission system.

Starting and Operating—Starting, stopping, and switching from one fuel to another are accomplished in the same manner as on the naturally aspirated engines. Since the gas flows through the starting air system, a hydraulic gas shut-off valve (B), Fig. 2, built to withstand the high starting air pressures, is installed in the supply line. The electric push button controls are connected to a solenoid operated pilot valve (A) which admits oil pressure to, or releases it from, the cylinder of the shut-off valve to turn on or off the flow of gas.

Adjustments—Adjusting procedures for setting pilot oil and balancing exhaust temperatures are virtually the same as for the naturally aspirated engines. Pilot oil pump rack settings are 3 mm. for the Model 60 and 9 mm. for the Model 80. The individual gas proportioning valves are located in the air starting valve assemblies (see Fig. 2). To make the adjustment remove plug (O), loosen locking sleeve (P) and turn valve (Q) with a screw driver. When adjustments are complete at least one of these valves should be wide open. Always replace plugs after completing adjustments. The engine mounted regulators may be adjusted without the use of a gauge by observing the position of the governor load indicator pointer at full load. This should be just under the transition point between dual fuel and diesel range. To adjust the regulator remove plug



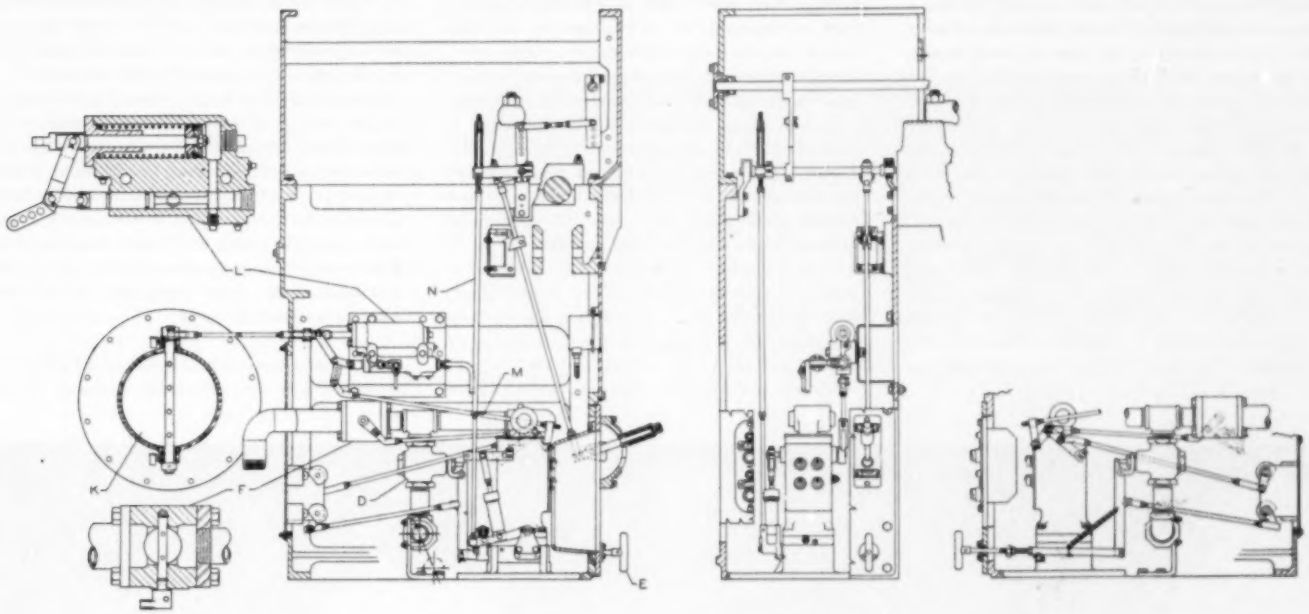
(R), Fig. 2, and turn the adjusting screw with a large screw driver. Running the screw down will increase the gas pressure and lower the load indicator reading. Regulator adjustments must be made when the full gas supply pressure is available. The gas injection valve tappet clearance should be checked whenever intake and exhaust valve clearances are set. The clearance is measured with a feeler gauge between the rocker arm and the push rod above the valve. The correct clearance is .015-in. for the Model 60 and .018-in. for the Model 80.

Lubrication—When intake and exhaust valves are lubricated, the gas injection valves should also be lubricated with the same light oil. This is done by pouring a small amount of oil over the end of the lever which operates the valve.

General Instructions and Precautions—The minute amounts of pilot oil which the pumps and nozzles must handle make it essential that this equipment be kept in first class condition. Worn or scored pump plungers will introduce difficulties in making pilot oil adjustments. Sticking or leaking nozzles will invariably cause poor ignition and resulting high gas consumption. For best ignition, the pilot oil setting should be just under the no load diesel requirement when the engine is hot.

Gases which contain significant amounts of casing head gas, crude oil, sulfur compounds, or other contaminants, may cause trouble. If necessary a suitable scrubber should be installed in the line to remove such impurities. If accurate and consistent metering of pilot oil is to be obtained, it is essential that air be kept out of the fuel system. In this connection it is wise to make the suction lift on the engine service pump as short as possible, and even desirable to have the fuel day tank above the pump inlet. It is also important that all joints in the suction line be kept tight in order to prevent air from being drawn into the system.

Naturally these instructions cover only dual fuel operation. It is expected that operators will refer to other sources for instructions on diesel operation as well as for information on maintenance procedures, adjustments, and other data which apply to both the diesel and dual fuel models.



Power Equipment Bulletin

A new 28-page bulletin briefly presenting products commonly used on power generating, transmission and distribution systems has been released by Allis-Chalmers Manufacturing Company. The bulletin covers generation, distribution and control equipment. Included under generation are steam and hydraulic turbines, generators and such auxiliary equipment as condensers, pumps and water conditioning. The power distribution classification includes transformers, voltage regulators, unit substations and circuit breakers. Miscellaneous motor control, switchgear and voltage regulation equipment is covered as well.

While Allis-Chalmers has for years manufactured a complete line of equipment for the electric power industry, the bulletin makes no attempt to cover the company's products that are primarily industrial machines. Copies of "Allis-Chalmers Power Equipment," Bulletin 25B6150C, are available upon request from Allis-Chalmers Manufacturing Company, S. 70th Street, Milwaukee, Wisc.

New Double Seal Representative

M. A. Moore, who has had engineering experience throughout the world, has been appointed sales and service representative for Double Seal Ring Company, of Fort Worth, Texas, in Maine, Vermont and New Hampshire, Buyrl Wilson, general sales manager, announced. Moore comes to Double Seal from General Motors Corp., where he was supervisor of sales and service for General Motors diesel engines at Houston. Moore's new headquarters are in Georgetown, Maine.

The new Double Seal representative has had a varied background in engineering and knows the importance of good piston rings in all types of engines. During the war he was supervisor of a team of technicians servicing diesel engines for the Navy in the Pacific. Moore worked five years in Panama in the operation and maintenance of diesel dredging equipment. Previously he had experience with the Bath Iron Works as operating engineer, Pan-American Airways as airport manager ,and in the Navy Corps of Engineering.

Centrifugal Pump Guide

Economical pumping units for every industry are catalogued in a new 16-page "Handy Guide to Selection of Centrifugal Pumps," released by Allis-Chalmers Manufacturing Company. A wide variety of units are indexed in this bulletin, including close-coupled, pedestal, double suction single stage, multi-stage, self-priming, fractional horsepower, coolant and circulating, fire, process, solids handling, marine, rubber-lined, paper pulp, sewage, axial and mixed flow pumps. Head capacity charts and tables for various types of the pumps are given along with data on sizes, capacities and construction features. Copies of "Handy Guide to Selection of Centrifugal Pumps," bulletin 52B6059G, are available upon request from Allis-Chalmers Manufacturing Company, 961 South 70th Street, Milwaukee, Wisconsin.

DIESEL-POWERED GENERATOR ELECTRIFIES GREYHOUND RACE TRACK

By HARRIE H. BIERMAN

ONE of the more popular "spectator" sports in Florida is greyhound racing. This popularity has spread to other states, as well. In fact, a magazine, published in Miami (*Greyhound Racing Record*) is devoted to the more technical aspects of this sport. In Florida, alone, there are no less than 13 greyhound racing tracks, located in or near the state's larger population centers. During the 1949-1950 season, ended this last Spring, the Florida tracks had a total paid attendance of 2,519,378, who wagered $78,361,000 on the results. These tracks are operated under the direct supervision of the Florida State Racing Commission. Since betting is legalized, through the pari-mutuel machines, at the various tracks, a part of the wagered money and admission fees go to the state for various earmarked purposes. Off-track betting through privately-operated betting commissioners ("bookies") is illegal.

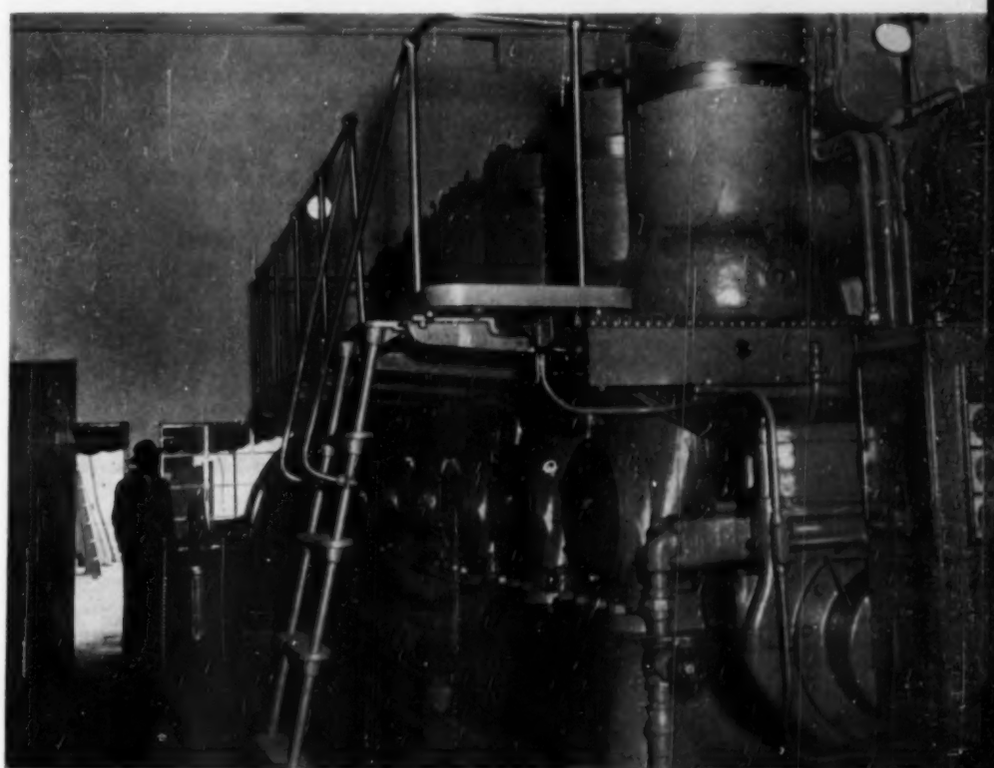
As greyhound racing *is* a spectator sport, it is conducted with a good bit of pageantry, including a band at many tracks. Led by a head groom, and each accompanied by its own groom, the dogs parade past the spectator stands, in a rather colorful procession. The costuming of the dogs' attendants varies with the individual track, and may vary, from season to season, at the same track. A favorite, which has been used many times, for the head groom approximates that of the Master of Hounds at a British fox hunt—a red coat and visored black velvet cap. After the technicolor procession proceeds past the spectator stands, it goes by the judges' stand. The judges consist of a head judge, an associate judge, and a third judge, representing the State Racing Commission. The judges compare the dogs shown with the listing of those scheduled to run, to see that no "ringers" are introduced, and the dogs are checked to see that they are properly muzzled. A fast dog may also be ill-tempered, and the normal results of the race must not be disrupted by a quarrel between dogs. At the scheduled time for a race to start, the dogs entered for that race, after being checked by the judges, are conducted to the starting boxes. These are individual kennels, arranged in a straight line at the starting mark. They are opened simultaneously, so that all dogs have an even start. In most cases, the release is done by electricity. While equipment details at individual tracks may vary somewhat, for the most part, it is electrically operated. First, the racing oval, itself, must be well-illuminated. Spectators will demand a clear view of the races. The "lure" (generally a stuffed rabbit) is electrically-operated.

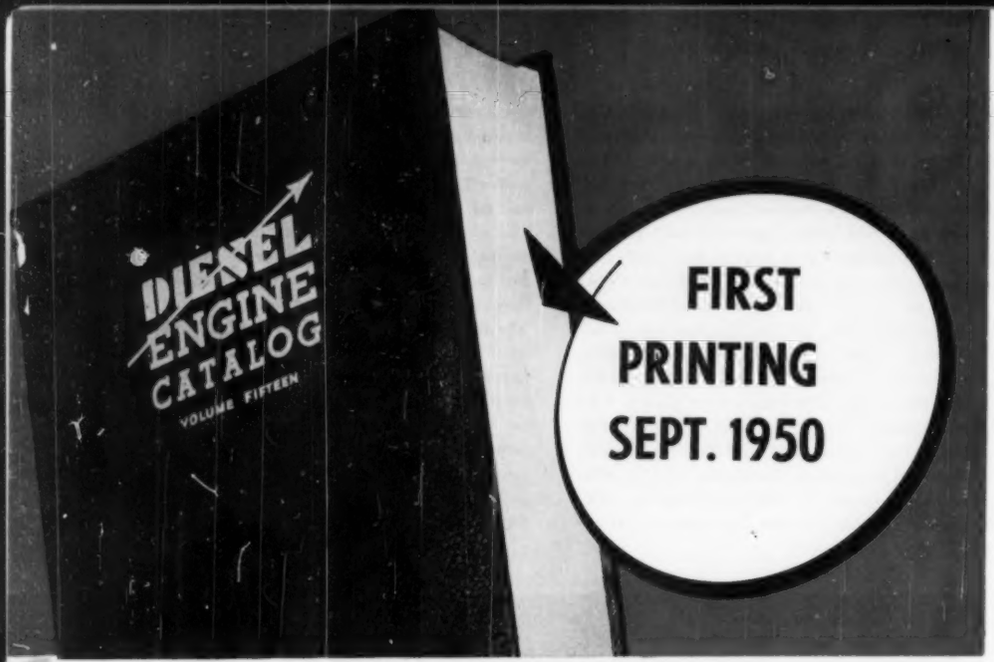
The starting boxes, often synchronized with the lure, generally are electrically operated. When

they *are* synchronized with the "lure," their operation is necessarily electrical. The lure moves along its track, which has an electrical contact, at a predetermined point. When the lure passes that point, contact is made, and the current operates a mechanism, releasing the dogs for their pursuit of the lure. The pari-mutuel machine (a room-size mathematical mechanism) which computes the "odds" on the contesting dogs, from the wagers placed at betting windows in a matter of seconds after the actual bets are made, is electrically operated. As a dog crosses the finishing line, he breaks a light beam, operating a photo-electric cell, automatically recording his running time, and flooding the finish-line with light, from which a photograph of the finish may be made, proving beyond doubt the winning dog in the race (dogs wear numbered blankets). There generally is an electrified public address system, over which racing results are given, and any other announcement may be made. There, also, is an electrically operated "odds board," giving the odds, as established by the pari-mutuel machine. This board tells prospective betters the "price" of the contesting dogs in the next race, thereby stimulating business at the betting windows.

From the foregoing, it readily will be apparent that the mechanism of conducting a greyhound racing plant is highly dependent on an uninterrupted flow of electricity. For instance, at a Massachusetts track, there was a power failure, which stopped the operation of the "mechanical bunny," and a resultant cancellation of that and all later races for the evening, a mishap no track management can afford. About two years ago the Hollywood Kennel Club of Hollywood, Florida, purchased a Fairbanks-Morse, 450-hp., 6-cyl., Model 32-E-14 diesel engine and generator, as a safeguard against a possible power failure. The club management continued to supply most of its electrical needs with purchased power, but in that way, faced another problem. The utility, which provides purchased power in southeast Florida, has a problem, too—a current-production problem, originating from the area's varying population. During the winter season, when the greyhound tracks are in operation, the area's hotels, apartment houses and other available housing facilities cater to an unforeseeable number of persons, using an unpredictable amount of current. Hence, in spite of vastly-expanded generating facilities, there is always danger of a voltage drop, which may result in an electrically-powered mechanism failing to function as it should. For example, the electrically-powered lure might not move along at its normal speed, and the dogs might overtake it, if there should be a sudden voltage drop due to the overloading of power lines among the utility's various subscribers. If the dogs should overtake the lure, the race would be cancelled, and all money bet on it would have to be returned. Considering this situation, it should be understandable that, during the racing season, the Hollywood Kennel Club used its F-M diesel engine and generating set as a supply source for the current required for its normal needs. The diesel and generator operate, during the track's racing season, about 5½ hours per evening—between 6:30 and midnight, developing 1,200 kwh. per night.

The diesel engine, generator, and accessory equipment are housed in a separate, concrete structure, 12 ft. by 40 ft., at one end of the plant's racing oval. The Fairbanks-Morse engine, used here, has a rating of 450 hp. at 300 rpm., and it is direct connected to an F-M 300-kw. generator with F-M exciter. The cylinders have a 14-in. bore and 17-in. stroke. Except the piston rings, which are Cook, all internal parts of the engine are of Fairbanks-Morse manufacture. The same is true, too, of the fuel oil filter, fuel oil transfer pump, and cooling-water pumping system. The jacket cooling system is of "closed" type. The engine is air started. The air-compression pumps are of F-M manufacture, while the air storage tanks are Scaife Company. The engine governor is Woodward, with an automatic safety control of ASCO manufacture. The exhaust pyrometer is Alnor. The current distribution, control and switchboard instruments are Westinghouse. The heat exchanger is Ross, while the exhaust silencer is Maxim. Since the diesel engine installation is housed in a separate building, no vibration-isolation was deemed necessary. The same was true in regard to insulation against engine room noise. The engine is fueled with No. 2 grade. The diesel-powered generator produces at the rate of 12.94 kwh. per gal. of fuel oil. The lube oil used is D.T.E., "extra heavy marine type," and it is filtered by a filter of F-M manufacture. There is no reclamation or cooling system for lube oil. Since the main purpose of the generator is to serve as a "stand by" in the event of a power failure, and to produce an equalized current, free from the fluctuations of a variable load—as is the case with purchased power in the area—no record of current production costs is kept.





DIESEL ENGINE CATALOG

ENTIRELY REVISED AND RE-WRITTEN

Volume Fifteen of the DIESEL ENGINE CATALOG came off the press September Fifth — a complete revision of Volume Fourteen — many new engines, new models, new ratings.

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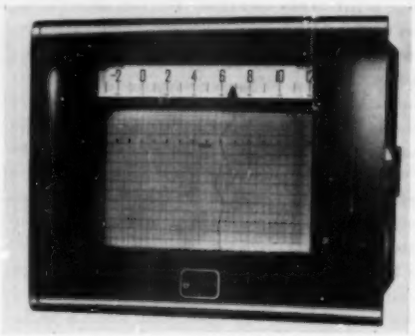
New Strip-Chart Electronic Instruments



The Bristol Company, Waterbury 20, Conn., announces the development of a new line of strip-chart electronic instruments, described as the Series 500 Strip-Chart Dynamaster Electronic Instruments. The Strip-Chart Dynamaster is a high-speed, self-balancing a-c bridge designed for measurement of temperature, resistance, conductivity, strain, position, inductance, pressure, force, or any other variable which can be measured in terms of impedance. In addition, the instrument can be used for electric power totalization and as the receiver for Bristol's Metameter System of Telemetering.

The measured variable is recorded on a chart 11¼ inches wide and indicated on a large scale which is legible at a distance. In addition to the single record model, instruments are available for as many as 16 different records on the same chart. Models are offered for full-scale pen travel in 7 records, 3 seconds and ⅔ seconds, with a full range of standard chart speeds from 1 inch per hour to 120 inches per minute. Supplementing the recording instruments, Bristol also announces a complete line of Strip-Chart Dynamaster Automatic Controllers, including both electric-operated types and Free-Vane pneumatic types. All Dynamaster strip-chart instruments are housed in a moisture-, fume-, and dust-proof case suitable for wall, flush-panel, or front-of-panel mounting. The scale and recording mechanism are mounted on the front of a hinged aluminum alloy panel, which is easily swung out to gain access to the electronic components or the control mechanism. These instruments are fully described in the company's bulletin No. W1821.

Booklet Release by Caterpillar

Low cost electricity through the use of Caterpillar diesel electric sets for on-the-job power anywhere is presented in a new 12-page booklet issued by Caterpillar Tractor Co. *Electricity Anywhere* tells of the many jobs to which Caterpillar electric sets can be installed. Of two types, self-regulated and externally-regulated, both sets are designed to offer users maximum simplicity. Illustrations and factual job data give the reader information on low-cost power for the amusement field, lumber and grain mills, power plants, mobile power units, radio stations, food marts and various other applications, employing diesel standby power. Copies of this booklet (Form 30007) may be requested from Caterpillar Tractor Co., Peoria 8, Ill., or from Caterpillar dealers.

New Fram Radiator and Water Cleaner

Fram Corporation, Providence, Rhode Island, has recently introduced its new radiator and water cleaner for cars, trucks and buses. Harmless to anti-freeze and radiator chemicals, the new device inhibits rust and corrosion, softens coolant water to stop scale deposits, and filters rust, scale and foreign particles from the coolant. It guards the cooling system against severe overheating, frequent cause of scored pistons and cylinders, burner valves, cracked blocks and heads, as well as other expensive repairs. A controlled amount of water flows continuously from the cooling system and enters the Fram Radiator and Water Cleaning Unit. Water contacts the chemicals for softening and inhibiting and passes through the filtering media where all solids are removed. Filtered, softened water containing soluble inhibitor reenters the cooling system and circulates throughout, with the result that cooling water is free of particles, cannot cause scale deposits, rust or corrosion. Easy to install and priced economically, the Fram Radiator and Water Cleaning Unit comes in two models designed to fit all cars, trucks and buses. Cartridge is easily and quickly changed.

New Diesel Towboat

Another modern new diesel-powered towboat will join the group of five to be placed in service next year on Pittsburgh District waterways, replacing steam sternwheelers. Dravo Corporation has announced that it will construct the sixth vessel for the Island Creek Fuel & Transportation Company, Huntington, West Virginia, for towing coal barges up the Ohio River from West Virginia to Pittsburgh. The Island Creek Company's towboat will be similar in design to the other five Dravo is building, two each for Jones & Laughlin Steel Corporation and Pittsburgh Consolidation Coal Company, and one for Crucible Steel Company.

Each vessel will be 108 feet long, 26½ feet wide and 9 feet deep. Their twin screws are to be driven by two diesel engines having a total of 1,000 horsepower. Crew quarters will consist of seven modern insulated cabins. While only about two-thirds as long as the sternwheel steamboats familiar in Pittsburgh River operations, the new towboats will have about 25 per cent more performance ability, Dravo reported. All six will be equipped with radar and other modern marine equipment, including Kort nozzles, that encircle the propellers and give the boats added pushpower.

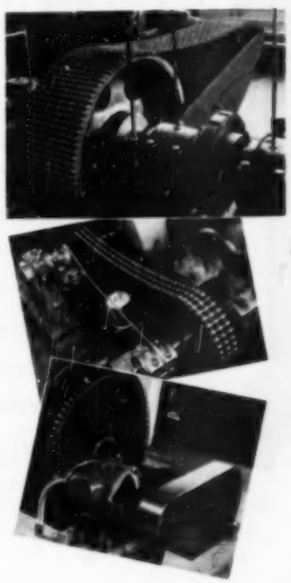
● **FOR ENGINE TIMING DRIVES**

Over 20 years of constantly increasing use of Diamond Chain for engine timing has well established such advantages as long life, accuracy and reliability. Loading is spread over a number of sprocket teeth, separating forces are absent while inherent elasticity compensates for heat expansion of engine and for torsionals.

● **FOR ENGINE AUXILIARIES' DRIVES**

Diamond Chain simplifies design, reduces the number of shafts and bearings, and improves performance in the driving of water, fuel, and lube oil pumps—blowers, tachometers, governors.

● **FOR POWER TAKE-OFF DRIVES**



Top: 12-strand Diamond Roller Chain from 500 h.p. diesel to generator (case removed). Middle: Triple Diamond Chain blower drive. Lower: Diamond Roller Chain (in case) driving exciter for diesel-operated alternator.

Diamond Roller Chains provide non-slipping, high-efficiency drives from engine to hoisting and construction machinery drums, to generators, exciters, blowers and pumps. They operate equally well on short or long shaft center distances.

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The Diamond engineering staff is well experienced in recommending drive selections to meet the exacting requirements of diesel, dual fuel and gas engines. Special precision manufacturing facilities and skill insure uniformity of quality and great reserve strength required for long-life performance.

Practical recommendations are yours for the asking.

DIAMOND CHAIN COMPANY, Inc.

Dept. 407, 402 Kentucky Avenue, Indianapolis 7, Indiana

DIAMOND ROLLER CHAINS

MAINTENANCE . . . *Continued from Page 59*

rod bearings were installed about five years ago, the one furnished from stock for No. 3 was a little undersize and had a few more thousandths clearance, but it was felt that it was not enough to warrant an exchange, as the unit was badly needed at the time, so we installed same and it has given no trouble in the past.

Shaft Distortion

As is our custom whenever a general overhaul is undertaken, we always take shaft distortion readings with a strain gauge between the webs. This practice was followed on this overhaul and the results recorded below:

	No. 1	No. 2	No. 3
Top Center	.000	.000	.000
90 Degrees	.00025—	.000	.00025—
Bottom Center	.001—	.000	.001-P*
270 Degrees	.000	.000	.0005-P*

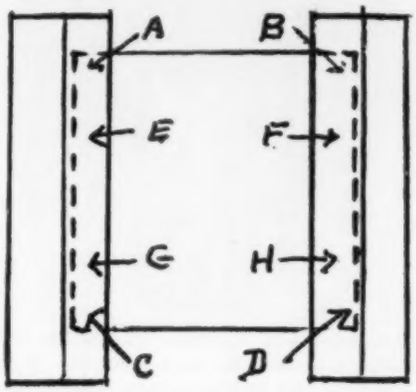
	No. 4	No. 5	No. 6
Top Center	.000	.000	.000
90 Degrees	.0005-P*	.0005-P*	.002—
Bottom Center	.001-P*	.000	.0035—
270 Degrees	.0005-P*	.0005-P*	.00175

P* denotes plus.

The above readings show that there is very little shaft distortion and that unit is well in alignment.

Cross Head Clearances

This engine being of the crosshead type, it is our practice to also take the crosshead clearances as listed below, Figure No. 3 showing the points where taken:



New Lima-Hamilton Diesel for New York Central

With the delivery of the first of 16 Lima-Hamilton road switchers to the New York Central System, details of this locomotive were disclosed for the first time by the Lima-Hamilton Corporation. The 1,200-hp. locomotive, Lima-Hamilton said, is similar in most respects to the 1,200-hp. switcher which has been in production for some time. It is powered by the same 8-cylinder, in-line, 9x12 engine, which is used in other Lima-Hamilton 1,200- and 2,400-hp. locomotives, and used also in a 6-cylinder version in the Lima-Hamilton 800-hp. switcher. The speed tractive-effort curve of the unit is practically identical to the 1,200-hp. switcher up to 28 miles an hour. The addition of a train-heating boiler has added 9 feet, 2 inches to the over-all length, and to provide better riding at high speeds, the truck wheel base has been increased by 1 foot, 10 inches. Also the fuel oil capacity has been increased from 600 to 800 gallons. Total weight in working order remains at 125 tons.

The following specifications apply to this locomotive: Length, 57 feet; distance between truck centers, 31 feet; truck wheel base, 9 feet, 10 inches; diameter of wheels, 40 inches; total weight in working order, 125 tons; continuous T. E., 34,000 lbs. at 10.7 mph.; maximum speed, 60 mph.; fuel oil capacity, 800 gals.; heating-boiler capacity, 2,500 lbs.; boiler water capacity, 800 gals.

DIESEL ENGINE CATALOG is just off the press in its Fifteenth Edition. Completely revised and up-to-date, it is invaluable to design engineers and buyers. ORDER COUPON ON PAGE 70.

The Best Protection

for your

DIESEL ENGINE $ INVESTMENT $

is the most economical

The old saying "Don't send a boy to do a man's job" pertains to Oil Filters, too.

MICHIANA-engineered Oil Filters have protected Diesel engines for many years—against premature wear—against unnecessary overhauling. On Diesel Locomotives their performance has been outstanding.

They cut lubricating oil costs, reduce oil changes and provide for long-life engine efficiency and economy . . . No one accessory is as important to engine performance and reliability as a good oil filter . . . Bulletin 45-D mailed on request.

ABOVE: *Pre-packed Michiana Filter Elements provide quick easy replacements.*

RIGHT: *Michiana 6-Element Filter installed on one of the latest model Diesel Locomotives.*

MICHIANA PRODUCTS CORPORATION

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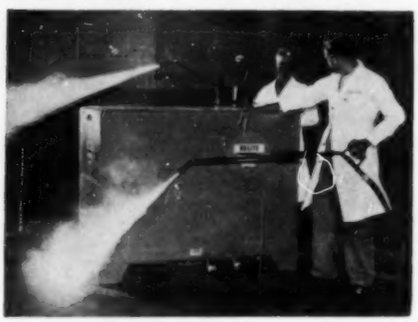
A-C Equipment Remodels Time Square

At the base of Manhattan's (New York) man-made canyon, an Allis-Chalmers AD-3 grader and HD-10 bulldozer help repave the "Great White Way." Frank Mascali & Sons, Flushing, Long Island, contractors, are stripping old pavement and car tracks, and resurfacing the entire length of Broadway from 42nd Street to Columbus Circle. While the HD-10 undertakes basic earth-moving and cutting, the AD-3 completes rough and finish grading between forms. Surging traffic, a Times Square trademark, rustles by, crowded as ever, in spite of the heavy construction program now underway. Vast numbers of "sidewalk superintendents" find the operations a welcome diversion to the ordinary hum of business that echoes throughout this fabulous district.

Vice President of General Electric

Robert Paxton, of New York, manager of manufacturing policy for the General Electric Company, has been elected a vice president by the G-E board of directors. Mr. Paxton was recently named manager of manufacturing policy. He had previously been manager of the Transformer and Allied Product Divisions, with headquarters in Pittsfield, Massachusetts.

Kelite Announces Steam Cleaner



The new Kelite HD Model S Steam Cleaner has a rated capacity of 260 gallons of solution vaporized per hour. This high capacity results from a Kelite development called the "water wall," composed of 42 feet of tightly coiled ¾-inch pipe located at the point of greatest heat radiation. Altogether, 330 feet of heavy-duty ¾-inch pipe is used in the water jacket. This design is so efficient that stack temperature is reduced to approximately 400°F., one-third less than conventional models. The gas fired model is priced at $819.00 f.o.b. equipment plant, Los Angeles. The oil fired model is priced at $879.00. Complete details are available from DIESEL PROGRESS, File 70, P.O. Box 8458, Los Angeles 46, Calif.

Hydreco Oil Hydraulic Control Devices

Just published by Hydraulic Equipment Company is an interesting folder on Hydreco gear pumps, control valves, auxiliary valves, cylinder assemblies and pump-valve-tank combinations. Typical delivery data on pumps, capacity ranges on valves, operating pressures, and other such vital data are given. This folder should be of considerable interest to users of hydraulic equipment.

Complete Engine Protection

Fram Corporation, Providence, Rhode Island, this year is adding new vigor to the promotion of its widely heralded "Complete Engine Protection." Complete Engine Protection is the new concept in automotive performance: endurance and freedom from breakdowns by sealing in power and sealing out deadly contaminants that rob miles from the life of an engine. Fram complete engine protection is accomplished by placing a Fram filter at every vital point where contaminants can enter or form. These include the Fram oil and motor cleaner, the Fram carburetor air filter, the Fram gasoline filter and the Fram crankcase air filter.

The Fram oil and motor cleaner "cleans the oil that cleans the motor" by removing sludge, abrasives and corrosives from the oil. The carburetor air filter removes dirt and dust from the air drawn into the carburetor. The gasoline filter protects finely adjusted modern carburetor mechanisms by removing dirt, water, rust and scale from the gasoline before it enters the carburetor. The crankcase air filter cleans the air drawn into the crankcase to prevent dirt and dust from grinding away vital moving parts. Fram complete engine protection is available for most passenger cars now on the road.

New Building for Cummins

Construction of a new building, 200 feet wide and 460 feet long, will begin immediately for the Cummins Engine Co., Inc., making available 2.1 acres of land under one roof and adding 92,000 square feet of floor space to the factory facilities. The new structure, known as the Stores Center Building, will become a central storage for all materials and supplies. It also will house quality control and inspection activities and an enlarged department for shipping service parts. Transfer of these activities to the new building will release areas in other buildings for production.

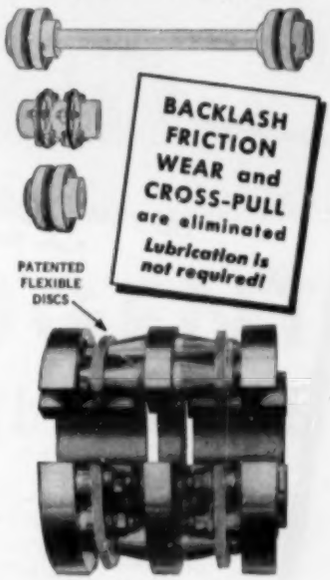
When announcing the major expansion, Irwin Miller, president of the company, said that by the time the new building is finished, Cummins will have expended more than $5,000,000 since the end of World War II for additional manufacturing facilities and for modernizing the Columbus plant. At the same time, production capacity has been increased by 60 per cent in a period of five years. The company currently employs about 2,300 people. Cummins has 84 models in the 50-550 horsepower range. They are used in earth-moving and mining equipment, work boats and pleasure craft, on-highway and off-highway trucks, and a variety of other heavy-duty applications.

THOMAS
Flexible ALL METAL
COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years



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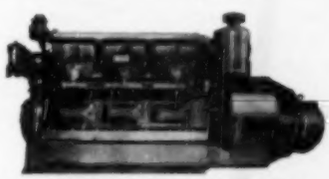
NO MAINTENANCE PROBLEMS.

ALL PARTS ARE SOLIDLY BOLTED TOGETHER.



FOR SUCH TOUGH JOBS AS: DIESEL COMPRESSOR DRIVES, MARINE MAIN DRIVES, LOCOMOTIVE MAIN DRIVES, AUXILIARY DRIVES, ETC.

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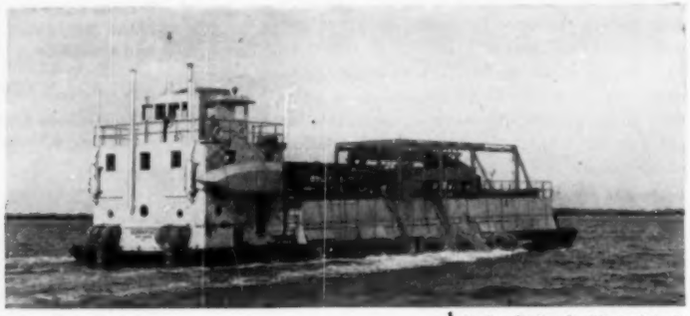
WARREN, PENNSYLVANIA

Diesel-Driven Racer Sets Record

Decisively smashing all existing world speed records for diesel-powered cars, Jimmy Jackson piloted the Cummins Diesel Special No. 61 to six new international marks, officially supervised by the contest board of the American Automobile Association, on Utah's Bonneville Salt Flats, on September 11. A new 1-mile record of 165.23 mph. and 1-kilometer mark of 163.82 mph. replace the former marks of 158.87 and 159.10 set several years ago by Capt. George Eyston, England's noted speed king. The new 5-mile record of 161.92 and 5-kilometer speed of 164.25 upset those of 112.07 and 126.990 set in 1934 by "Wild Bill" Cummings at Daytona Beach, Fla. Jackson's 10-mile record was 148.14 and his 10-kilometer mark 147.63. No official international records previously existed for these distances.

The car is the same one that attracted widespread attention in the 1950 Memorial Day 500-mile speed classic at Indianapolis when it qualified at 129.208 mph., subsequently going out of the race at 130 miles due to an accessory part failure. It was powered for the Bonneville tests with regular stock Mobilfuel diesel fuel and lubricated with stock Delvac oil. The only change made for the runs was the addition of a hood over the driver's seat to enhance streamlining. In accordance with AAA rules, the records were established by making two runs of the 15-mile straightaway course laid out on the marble-like surface of the fabulous salt beds, one run in each direction, with the official time an average of the two runs. The event was sponsored by the General Petroleum Corporation as part of its continuing program of testing fuels and lubricants under extraordinary stresses.

Technical data on Cummins Diesel Special No. 61: The engine is a revised, highly supercharged version of the standard "JS" model manufactured by Cummins for use in medium truck and bus applications. The diesel power plant is made of aluminum and magnesium and develops more than 340 hp. at 4,000 rpm. It weighs 2.06 lbs. per hp., which makes it one of the lightest and highest speed diesels ever used in competition. The engine uses standard Mobilfuel diesel, the same kind burned by trucks and in home furnaces, etc., and Delvac oil. Manufacturer is Cummins Engine Co., Inc., of Columbus, Ind. The chassis of this car was built by Kurtis Kraft, of Los Angeles, using a welded, tubular steel construction and an all-aluminum streamlined body. A Conze quick-change racing axle is used and Goodyear aircraft disc brakes are on all four wheels.



Hydraulic Dredge "Quinnipiac"

THE F. MANSFIELD & SONS CO.
Oyster Farms
910 QUINNIPIAC AVENUE
NEW HAVEN 12, CONNECTICUT

July 5, 1950

OUTBOARD PROPULSION GIVES NEW MANEUVERABILITY MOST PRACTICAL POWER

Murray & Tregurtha, Inc.
2 Hancock Street
North Quincy 71, Mass.
Att: Mr. Richard Matheeson

Gentlemen:

You may be interested in a report of our experience with the two Harbormaster units which you installed in our hydraulic dredge "Quinnipiac" in 1947.

The vessel is a wooden scow 96 x 30 and the twin units make it highly maneuverable and give a speed of 8 knots light and 6 loaded. They have been very satisfactory and are, in my opinion, the most practical power that can be applied to a scow.

Very truly yours,
J. R. Nelson
J. R. Nelson, Treas.

JRN/e

Write for Harbormaster Catalog containing over 70 photos and diagrams. Use coupon.

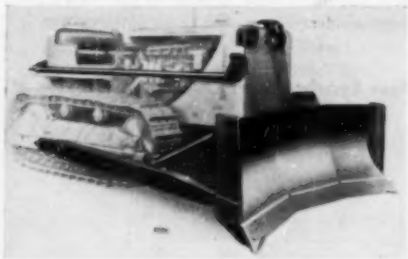
Murray & Tregurtha
HARBORMASTER
Outboard Propulsion And Steering Units

Murray & Tregurtha, Inc.
6 Hancock St., Quincy 71, Mass.
Please send catalog, without obligation, covering the HARBORMASTER Outboard Propulsion and Steering Unit.
Name .....
Company .....
Address .....
.....

Diesel-Driven Equipment Help Build Dam

Transporting giant rocks weighing from two to forty tons each from a quary to a point on the Columbia River below Grand Coulee Dam is the assignment of a fleet of Euclid end-dump trucks in the service of contractors Morrison-Knudsen Company, Inc. Assisting in the project, which is to build a riprap controlling the flow of water after it rushes over the dam from a 127 square mile reservoir, is a Manitowoc Model 4500 Crane. The crane drops the rocks into position along the water's edge. With 800,000 tons of stone to be moved the trucks are doing the job at the rate of 2,000 tons per 8-hour shift. The trucks are powered by two 6-cylinder GM diesel torque converter units with each engine driving a tandem drive axle through an Allison Torqmatic Transmission. A Twin-6 GM diesel powers the crane.

New Large Capacity Bulldozer



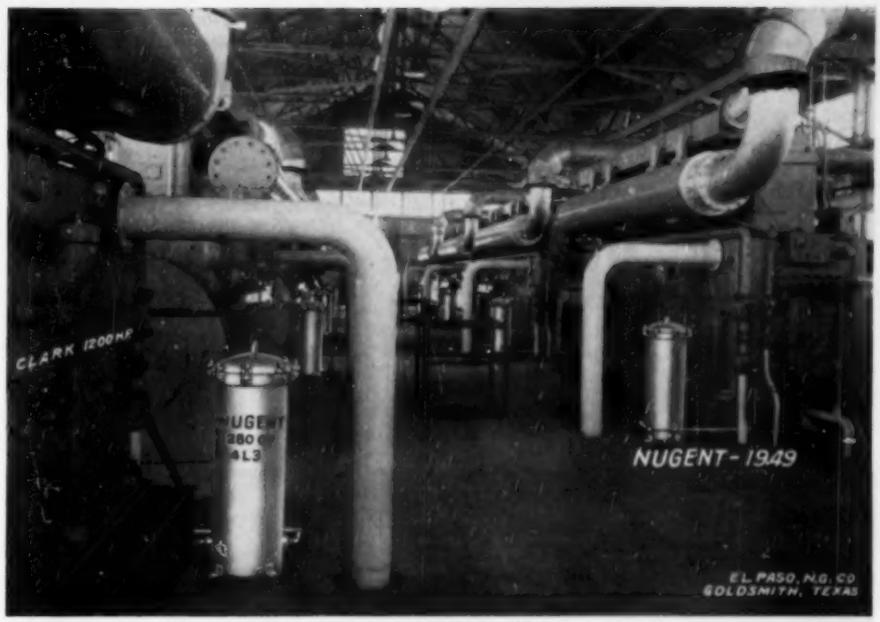
A new, large-capacity, U-shaped bulldozer, designed for universal use in a variety of earthmoving applications with the Caterpillar Diesel D8 track-type tractor, has been added to the heavy earthmoving equipment line of Caterpillar Tractor Co. The new design permits long-haul pushing of loose material with minimum end spillage when bulldozing straight ahead. It is an excellent tool for stockpiling, handling large-capacity loads, and allowing good maneuverability. The U-shaped bulldozer does smooth finishing, quick backfilling, and pioneering and side hill work. In addition, its U-shaped blade makes it a convenient tool for felling trees.

Designated as the No. 8U, the new bulldozer is similar to the standard Caterpillar 8S bulldozer except for the U-shaped blade, which necessitates longer push arms. The complete unit is cable-controlled and consists of blade, push arms, trunnions, cable, sheaves and sheave brackets. Cutting width of the blade is 11 feet, 11 inches, and it is 45¼ inches high. Maximum lift above ground at the center point of the blade is 47½ inches, and 54¾ inches at the end points. The limit of blade pitch adjustment is 10 degrees, and the maximum blade tilting adjustment is 16 inches. The No. 8U Bulldozer has a box-type moldboard construction, 1-inch steel cutting edge, and heat-treated carbon steel end bits. It may be operated with the Caterpillar No. 24 front single drum cable control or the No. 25 rear double drum cable control.

New Marine Accessory

An enlarged scale steering repeater with distinct advantages over the standard model has recently been introduced by Sperry Gyroscope Company. As implied in the name, its primary advantage is the expanded scale of the repeater card which permits reading of the ship's heading from a distance of several feet. Its design has eliminated the need for a magnified reading glass and cover. The price is therefore lower than the standard model with which it is interchangeable. Though the repeater is the same size as the model known to mariners for a quarter of a century, it has a card with degree graduations equivalent to those of a compass card 30 inches in diameter. For further information, write DIESEL PROGRESS, File 68, Box 8458, Los Angeles 46, Calif.

Clean oil means longer compressor life



with NUGENT ABSORBENT OIL FILTERS

Nugent Absorbent Oil Filters get out more of the harmful impurities that get into oil—99.8% by actual test and cleaner oil means that engines, compressors and all machinery will last longer and require less maintenance, while at the same time require less frequent replacement of oil.

Fig. 1280CP, the Nugent Filter type shown above installed on engine-compressor units at the Goldsmith, Texas, station of the El Paso Natural Gas Company, is typical of Nugent depth type pressure liquid filters. The filtering material generally used is a superior quality of cotton waste, wool, excelsior, asbestos or cellulose. No chemicals, bleaches or filtering earths are used. All units have very large capacity for their size. Fig. 1280CP is available in a wide range of capacities. Write for complete information.

Other Nugent filters are available to meet virtually every need.

Wm. W. Nugent & Co., Inc.
415 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • La Junta, Colo. • Los Angeles Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

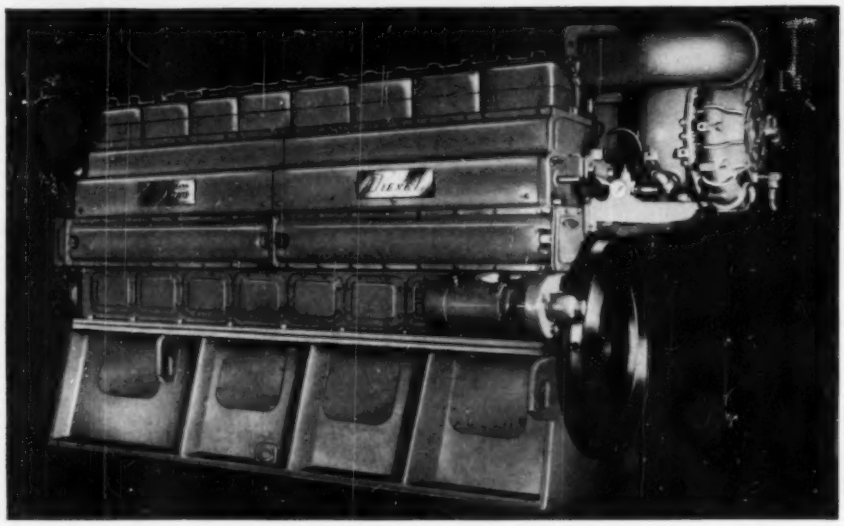
Established 1897

41st Annual Motor Boat Show

The 41st Annual National Motor Boat Show will be held in Grand Central Palace, New York City, opening Friday evening, January 12th, and closing Saturday evening, January 20, 1951. The prices of space per square foot will be as follows: Main Floor—$5.00; Mezzanine and Third Floors —$2.75; Fourth Floor—$2.50. These prices include a charge of twenty-five cents (25c) per square foot toward the cost of special show advertising.

Application for space together with floor plan of the department in which we believe you will be interested, are enclosed herewith. The space application form contains complete information regarding the arrangement of exhibits by departments and floors. Should you desire diagrams of other floors, please write us promptly. Allotment of space to our members began Monday, October 16th. Preference will, as usual, be given to members' space applications received at this office prior to the above allotment date. Your application form should contain complete particulars of your proposed exhibit and must be accompanied by a payment equal to at least 25 per cent of the total cost of space applied for by you. Please give this matter your immediate attention and file your application with us promptly, in order that our show committee may be able to give every possible consideration to your space requirements.

More POWER... *Less* SPACE
WITH
STERLING VIKING DIESELS



This 8-cylinder turbo-supercharged Viking Diesel is conservatively rated at 750 hp. Sterling Diesels are available in five different models beginning at 100 hp.

DIESEL POWER
for all
INDUSTRY

AUTOMATIC POWER PLANTS
DRILLING RIGS — HOISTS
LOCOMOTIVES — PIPE LINES
GENERATOR SETS
FISHING CRAFT — DREDGES
LIFT BRIDGES — TOW BOATS
COMPRESSORS — AIRPORTS
VENTILATING SYSTEMS
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SHOVELS

Sterling Viking Diesel engines offer definite advantages in:

Compactness . . . more power in less space. A high ratio of horsepower to weight.

Sturdy construction . . . one piece block and base. All working parts are easily accessible.

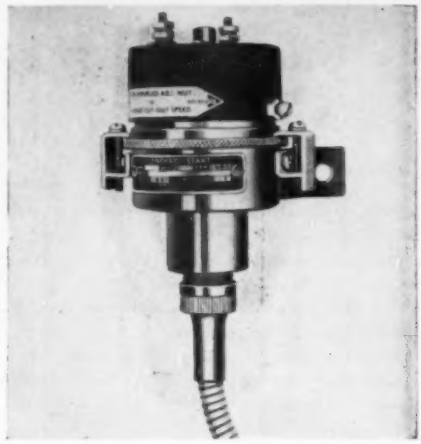
Dependability . . . Service records show a high operating efficiency, low maintenance cost. All Sterling Diesels are conservatively rated, built to deliver smooth performance over their full power range.

Without cost or obligation, talk over your power requirements with an **experienced** Sterling engineer. We invite your call and the opportunity to bring you up to date on Sterling's accomplishments.

STERLING ENGINE COMPANY
1270 Niagara St. Telephone Lincoln 0382 Buffalo 13, N. Y.

Sterling Viking Diesel Engines from 100 to 750 hp.—Sterling Gasoline & Gas Engines from 100 to 600 hp.

New Synchro-Start Overspeed Governor



Synchro-Start Products, Inc., has just developed a new overspeed governor for safety shut-down of internal combustion engines and machinery. It is adustable to decrease or increase the shut-down speed while running. Model GFA comes equipped with automatic re-set and GFM with manual re-set. New features of this governor are: sealed steel ball bearings with extra lubricant reservoir sufficient for life run; and a standard take-off for heavy duty tachometer drive for use with a flexible shaft.

This new governor is of full metal construction, equipped with mounting bracket, 5 inches in height, and approximately 3 pounds shipping weight. It is now being tooled for production and expected deliveries to start in December, 1950. Models GFA and GFM augment the line of GP and GK overspeed governors for standard SAE drives which have been in production many years. For further information write to Synchro Start Products, Inc., 1046 West Fullerton Ave., Chicago 14, Illinois.

Appointment at Detroit Diesel

R. D. Redner

The promotion of R. D. Redner to sales representative of the Detroit Diesel Engine Division of General Motors has been announced by V. C. Genn, general sales manager of the division. In his new capacity, Redner will promote the sale of General Motors Series 71 and new 275-hp. "6-110" diesel engines through the division's distributor organization in Minnesota, North and South Dakota, Iowa, Nebraska, Western Missouri and Kansas. Redner, a graduate of the University of Michigan, served a major oil company in the Netherlands West Indies before joining Detroit Diesel's sales department in 1948.

Frictionless, Chemically-Inert V-Rings

Crane Packing Company, of Chicago, one of the original fabricators of Teflon Packings, has recently announced the perfection of "V-Ring" type packings molded from pure Teflon. This development is the newest in the growing line of "Chemlon" (Teflon-fabricated) packings made by the company. Molded by a specially developed process, these V-type packings combine the chemically inert and frictionless properties of Teflon with the resilience and toughness needed for proper sealing results. A special cross-section design insures permanent sealing, even under varying pressures, at temperatures up to 450°F. The low friction characteristics and the ability of these V-Rings to withstand higher temperatures and corrosive chemicals make them of great value to the chemical field since they increase the scope of hydraulic applications to it. Formerly, many of the newest hydraulic developments could not be designed into equipment because of the service limitations of synthetic rubber "O" and "V" rings.

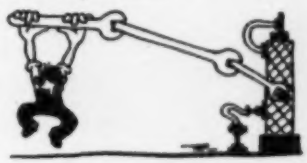
Development of these rings is of particular importance to valve manufacturers because of the frictionless characteristics. Although only recently introduced, they have already been adopted by several leading manufacturers as a standard part of their valves. It was found that they stand up several times longer than conventional packings previously used, and that they form a perfect seal with just finger-tight pressure on the gland. Chemlon "V" Rings are available in many standard sizes from stock. Additional sizes will be specially molded to meet specific requirements. Other Teflon-fabricated packings offered by the Crane Packing Company include braided types, French and standard ring gaskets, extruded and machined forms, and a wide variety of molded shapes for packing and electrical insulation use. These are all described in a special booklet, "Packings for the Chemical Industry," offered free by the manufacturer. For further information, write DIESEL PROGRESS, File 69, P.O. Box 8458, Los Angeles 46, Calif.

Changes at Fairbanks-Morse

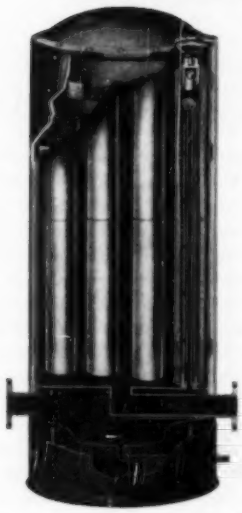
Mr. H. V. Peterson, manager, Railroad Division, Fairbanks, Morse & Co., Chicago, has announced the following changes: Mr. J. G. Graham, who has, for the past several years, been with the Railroad Locomotive Division of the company, with headquarters in Chicago, has now been appointed Eastern regional manager of locomotive sales. He will be located in New York City, where he will have jurisdiction over the sales of locomotives in the New York, Southeastern and Cleveland areas. Mr. D. C. Prescott, who has for the past year been a representative of the locomotive sales staff in the Chicago district, has now been appointed district manager, locomotive sales of the Southwestern district, and will be located in St. Louis after October 1, 1950.

C. H. Morse, Jr.

Mr. C. H. Morse, Jr., who has been, for the past year, assistant manager of diesel locomotive service, with headquarters at the Beloit, Wisconsin, works, has been appointed district manager, locomotive sales, with headquarters in Chicago. He will have sales jurisdiction over the Chicago and St. Paul-Minneapolis areas.



HONAN-CRANE Oil Purification offers

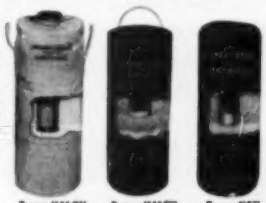


3 *types of interchangeable*
CARTRIDGE REFILLS
for correct handling of every purification problem

Three types of cartridge refills, designed by Honan-Crane especially for Honan-Crane purifiers, make it possible for you to select the filtering medium best suited to your purification needs. Cartridges are interchangeable and may be used to remove either solids or products of oxidation . . . maintaining any oil in approximately new condition.

Easy-to-handle Honan-Crane refill cartridges are your assurance of thorough oil purification at lowest cost.

Honan-Crane Type "M" Continuous Oil Purifier
Multiple-cartridge purifier, available in eleven sizes using 1 to 24 cartridges. Provides high flow rate and is designed to use easy-to-change "MC", "MF", or "S" type cartridges.



Type "MC" Type "MF" Type "S"

Honan-Crane Type "MC" Cartridge
"MC" Cartridge is a woven cotton bag containing 1.5 pounds of Cranite (specially processed fullers earth). Solids and abrasives as well as soluble products of oxidation such as asphaltenes, resins and acids are removed from the oil.

Honan-Crane Type "MF" Cartridge
"MF" Cartridge is a perforated metal basket lined with a woven cotton sock material and uniformly packed with Palconia (specially selected cellulose fiber filtering medium). Complete removal of solids such as abrasives, scale and other foreign matter.

Honan-Crane Type "S" Cartridge
Type "S" Cartridge contains 4½ pounds of Palconia tightly packed in a specially woven cotton sock material. Performance of the cartridge is comparable to the "MF" cartridge in removal of abrasives, scale and other foreign solids.

Write for descriptive bulletins covering Honan-Crane Oil Purification Equipment for Diesel Lube and Fuel Oils, Turbine Oils, Cutting Oils, Quench Oils, Coolants, etc. State type of purification problem.

HONAN-CRANE CORPORATION
202 INDIANAPOLIS AVE., LEBANON, INDIANA
A Subsidiary of HOUDAILLE-HERSHEY CORP.

ABOE Comes of Age

During the past year our readers have often seen mention of the activities of ABOE, Inc. Here for the first time we give an account of the planning, organization, and sales promotion behind these activities.

At the end of October, 1949, the New York daily newspapers carried word of the formation of a new company, Associated British Oil Engines, Inc., and of the election as its president of Ronimund Bissing. The company was formed as a subsidiary of the Associated British Oil Engines Group of England, which accounts for about 35 per cent of the total British diesel engine production and is claimed to be the largest diesel exporter in the world. It is a private group of companies with one management under the overall direction of Mr. Alan P. Good. The new company's principal task was to be the marketing in this country of the range of small diesel engines from 3 to 36 hp. manufactured by the Group, although it was also authorized to handle the whole range of diesel engines up to 3,000 hp.

The task of the management of the new company was no easy one. For one thing, the Petter engines were virtually unknown in this country. Petter is one of the oldest diesel manufacturers (it started diesel production in 1898) and the engines have sold for years throughout the world. It has its agents in 83 different countries, but until now Petter had never been introduced into the United States and few Americans had heard the name. The new company had to start from scratch. Many similar experiments had been tried by foreign firms attempting to enter the United States market and the toll had been a heavy one. Mr. Bissing, however, had lived for many years in this country and perhaps for the first time a truly American approach to the American market was planned and carried out.

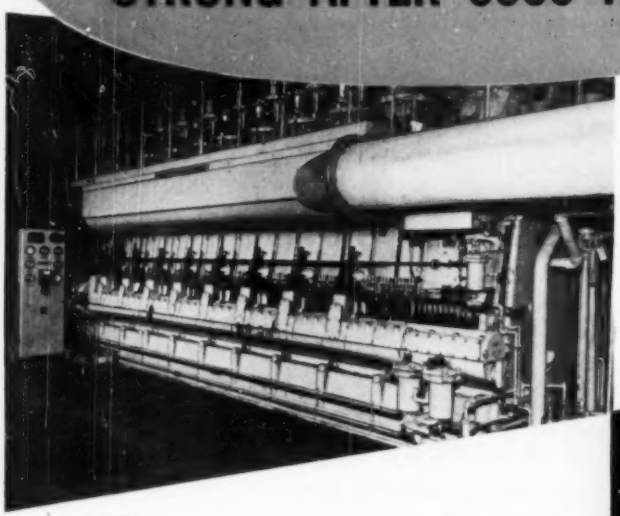
The basic necessities for entering this market were quickly grasped and were formulated under the following points: (1) To set up nation-wide distribution (2) to insure service and spares to all purchasers; (3) to convince distributors and the public of the quality of product and the continuity of supplies; (4) to convince the distribuotrs and the public of the permanence of ABOE, Inc.

These points were tackled systematically and simultaneously. It is interesting for us to see how an outside firm sums up the necessities for this market and how this particular firm set about meeting them. It can well serve as a model to other firms seeking to do the same thing and even to American enterprises at their inception. ABOE started by setting its sights high. It aimed at securing as its distributors the top diesel distributors in the entire country. Because its Petter engines are first-class in design and performance, extremely competitive in price, and do not compete in horsepower with the large American diesel manufacturers, it was successful in lining up an outstanding list of distributors. One might almost say that they consist of the pick of the country's diesel distributors. For example, the Petter distributors in Florida are the Cleveland Diesel Division of General Motors itself; in Los Angeles, the Shepherd Tractor and Equipment Company, probably the largest Caterpillar distributors in the world; in Texas, Stewart and Stevenson Services, Inc., largest General Motors diesel distributors in the country. Within six months the principal points of their organzation were already established with about twelve key distributors with their subsidiary dealer organization.

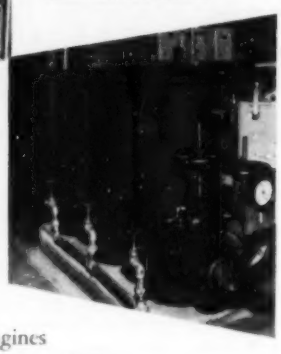
ABOE believed that in appointing distributors of this caliber, they could provide the best answer to the second point: that is, insuring service and parts. They reasoned that a purchaser buying a Petter engine from any one of these firms would not even question whether he would get service and parts since the whole reputation of the firm had been built on giving service. For the supervision of this distributor organization, ABOE appointed its own regional sales managers. The first to be appointed was Mr. John A. Jones, who until then had been manager of the San Francisco office of the Atlas Imperial Diesel Company. Another outstanding ABOE regional sales manager is Mr. Roy Leffingwell, who was manager of the Cummins Diesel Sales of New York until he joined ABOE. The regional sales managers are equipped with ABOE station wagons which carry a demonstration Petter engine, together with racks of literature and everything needed for sales.

In the ABOE head office organization are men trained in the factories in England and sent out to the United States to assist in sales here. Mr.

WINSLOW ELEMENTS STILL GOING STRONG AFTER 6500 HOURS!



One of the two 2160-HP Nordberg engines that supply power for both industrial and domestic use serving the city of Tucumcari, New Mexico.



Winslow Lube Oil Conditioner Models 57-931-A in operation at the Tucumcari Municipal Light and Power Plant.

Winslow Full-Flow Filters on the two big Nordberg engines which supply power for the city of Tucumcari, New Mexico, give full protection to lubricants and help keep these powerful diesels running with maximum efficiency. "We have had one filter in use about eleven months with about 6500 engine hours run without replacement of filter elements," states J. D. Armstrong, Manager of the Tucumcari Light and Power Department. "The oil is still in perfect condition. I think Winslow Filters are the finest on the market today."

FOR LONGER-LASTING, LOWER COST, MORE DEPENDABLE PROTECTION OF YOUR ENGINES, WRITE US FOR DETAILS.

WINSLOW FILTERS

503-H-2 Winslow Engineering Company 4069 Hollis Street • Oakland 8, California

David W. Mansell, chief engineer of ABOE, had been in charge of the experimental department of Petters Ltd. in England. Mr. Dennis C. Watmuff had been area superintendent for the western hemisphere at the London office. Mr. Tom Love was the top service engineer available in the organization. As soon as distributors are appointed, they are visited by ABOE's staff. Mr. Mansell instructs in the engineering aspects and the applications for which Petter engines can be used. Mr. Love instructs the personnel in the servicing of the engines. The regional sales manager in the area spends some time giving advice and guidance on sales and dealer organizations.

The response has surprised even ABOE. The performance of the small diesels has been very satisfactory. One famous pump manufacturer who had been searching for a small diesel ran a test on the 1-cylinder, 5-hp. Petter; the test engineers were worried about vibration, which is regarded as a major problem with small diesels, particularly 1-cylinder models. So they ran the test with a Petter mounted on wooden blocks and secured by only four nails. The engine ran for three weeks—no vibration. In telling this story, ABOE found that it was greeted with skepticism, so they mounted a similar engine in New York for demonstration and secured it with only two nails. Then during the demonstration they removed even the two nails—and the engine still ran quietly and steadily. Now, at the end of the first year, a number of the country's best known national manufacturers have tested and approved the Petter and are quoting it with their equipment.

The continuity of supplies had been one of the hardest problems to tackle. ABOE's own distributor organization, even apart from manufacturers' considering using Petter engines, and the ordinary man thinking of buying one, all come up with a doubt as to whether, in handling a foreign engine, they can be assured of continuity of supplies, particularly of spare parts. Many American firms suffered seriously in the last war, when spare parts for foreign engines suddenly became unavailable. "Once bitten—twice shy" was an objection which ABOE realized it had to overcome at the outset if it were to be successful. A novel method has been devised to meet this problem. ABOE decided that it was not sufficient to carry substantial stocks of engines in New York because to a man on the west coast, or in the midwest, New York is a long way off, and the only fact which convinces him in the end is actually seeing the supplies with his own eyes. ABOE has therefore arranged with all its distributors to warehouse stocks of engines and spare parts themselves. These stocks are over and above what the individual distributors would order for their own account and the distributor is not burdened with a heavy inventory; but, at the same time, he has the satisfaction of having them under his own roof and being able to demonstrate to prospective customers that the engines are physically available for immediate delivery. In the case of spares, even this was not considered sufficient. In view of the fears which have arisen in many people's minds following on the Korean crisis, stocks of spares have been increased over and above what would be considered normal in normal times. Mr. Bissing has now laid down as policy that every engine in the United States should have with it sufficient spares for 7,000 hours' operation. This is the equivalent of two to three years' operation and is more than most American companies carry.

The actions taken to cover the first three points supply the substance for the fourth point; i.e., convincing distributors and the public of the permanence in the United States of ABOE, Inc. At the same time it was recognized that more was needed to establish this as an incontrovertible fact. It was necessary to put it across.

From the outset ABOE started a campaign of national advertising. They also participated in the principal exhibitions where their engines could profitably be put on display. This included the New York Motor Boat Show, the British Automobile and Motorcycle Show, the ASME show in Baltimore, the Houston Industrial Fair, and the Chicago International Trade Fair. An ambitious departure was made early in the new company's history when, in April, they held a national convention at the Waldorf-Astoria Hotel. They invited their distributors and dealers to send representatives from all over the country to attend a two-day convention which led on into the British Automobile and Motorcycle Show, at which they had a 1,000 sq. ft. of exhibition space. Distributors came from as far away as Los Angeles and Portland, Oregon. The convention went far to convince the distributors of the soundness of the

Yorktown Seafood Company's ocean trawler "Ocean Clipper"

FLEET OPERATORS really back up such statements with authority. Here's convincing proof from an expert judge of engine performance and operating costs, W. J. Shields, General Manager, Yorktown Seafood Company, Seaford, Va.: "From long experience with Lister-Blackstones on our trawler OCEAN CLIPPER and her two sister vessels we are particularly pleased with Lister-Blackstone's cost of operation — THE LOWEST COST WE HAVE EVER EXPERIENCED!"

LISTER-BLACKSTONE 9 h.p., single cylinder model 9/1 of the type used for providing auxiliary power requirements for the vessels of Yorktown Seafood Company's fleet.

LOOKING TO SAVE? ANXIOUS ABOUT DELIVERIES? ORDER NOW — GET BEST DIESEL VALUE FOR YOUR DOLLAR AT REDUCED PRICES! 3 to 480 h.p., propulsion and auxiliary. Service and parts from Lister-Blackstone distributors everywhere. Write us your requirements. Address Dept. DP.

Lister-Blackstone

LISTER-BLACKSTONE, Inc.

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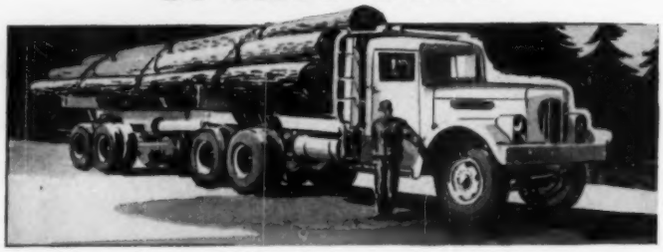
Sold and Serviced in 37 Countries Throughout the World

DIESEL SLEEVE BEARINGS
of ANY TYPE



Precision-made Johnson Bearings contribute to the performance of many kinds of equipment . . . from great diesels and gigantic industrial machines to automobiles, to tiny electric motors. Johnson Bronze produces sleeve bearings for every purpose, in all types, in a vast range of sizes. From this wide experience they have gained invaluable knowledge on bearing applications of every kind.

You may profit by consulting with Johnson Bronze engineers on your diesel needs. They have helped others decide on the correct bearing. They will gladly study your requirements and make recommendations on the type and design of bearings needed. Write, wire or call today for an appointment.

for your files . . .
FREE ● A series of data sheets, prepared by Johnson engineers, is written in concise, factual form. They cover tolerances, alloys, bearing design, lubrication, powder metallurgy, etc. Write for a set.

Johnson Bronze
SLEEVE BEARING HEADQUARTERS
445 SOUTH MILL STREET • NEW CASTLE, PA.

Call JOHNSON BRONZE at ATLANTA • BALTIMORE • BUFFALO • CAMBRIDGE
CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • KANSAS CITY
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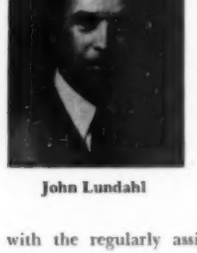
ABOE program and of the determination of ABOE's management to succeed and to stay in this country. A highlight was the closing dinner, at which the principal speaker was Mr. Don A. Mitchell, president of Sylvania Electric Products, Inc. It was particularly appropriate that Mr. Mitchell should have been the principal speaker on that occasion, as he had just returned from a visit to England with a team of American sales executives, instructing the British on how to sell in America. In his speech, which must have warmed the hearts of ABOE's management and the visiting dignitaries from the English organization, Mr. Mitchell congratulated them on the way in which they had tackled this market and said that if his visit to England had been six months earlier instead of only a few weeks before, he would have credited the whole plan of campaign to his own advice, because ABOE was doing exactly what he had been trying to persuade British businessmen to do.

ABOE's latest promotional campaign goes into operation in November, as has already been announced (see September issue, page 91). This is a tour right across the States of a special mobile exhibition unit. The unit consists of two 30-foot trailer trucks, one of which has accommodations for the four-man crew and stores the engines, and the other becomes the exhibition unit itself. It is considered to be the most modern and effective demonstration unit of its kind in the world and already has created great interest in this country. The exhibition will make its debut at the Southwestern International Trade Fair, San Antonio, Texas, on November 3rd, and this will mark the beginning of its nation-wide tour.

So ABOE celebrates the end of its first year of operations with a record of accomplishment which is probably unprecedented for a new firm. It launches into the second year with a bold move characteristic of its management. We shall watch its future with great interest.

Appointed Sales Representative for Detroit Diesel



John Lundahl

John Lundahl has been appointed to the newly created position of sales representative-at-large by the Detroit Diesel Engine Division of General Motors Corporation, it has been announced by V. C. Genn, general sales manager of the division. Lundahl will be on special assignment, working with the regularly assigned sales representatives throughout the country. He will also be available when needed to assist in the engineering of special GM diesel engine installations in the industrial field. A native of Cleveland, Ohio, Lundahl comes to Detroit from St. Louis, where he served the Western Machinery and Engine Company, GM diesel distributors, as vice president in charge of sales and service.

DIESEL ENGINE CATALOG is just off the press in its Fifteenth Edition. Completely revised and up-to-date, it is invaluable to design engineers and buyers. ORDER COUPON ON PAGE 70.

New Waukesha Power Units

Waukesha Motor Company in announcing a new line of industrial engines introduces a series of portable power units built around three basic sizes, a 4-cylinder and two 6-cylinder engines. These three basic sizes are made as diesels, gasoline, butane or natural gas engines ,and carry approximately the same output ratings, size for size, whether diesel, or carbureted fuels are employed. The Model 180-DACU portable power unit has a 3-5/16-inch by 3¾-inch, 129 cu. in. 4-cylinder diesel engine with a continuous output rating of 22 hp. at 1,800 rpm. The Model 185-DACU portable power unit has a 3-5/16-inch by 3¾-inch, 194 cu. in 6-cylinder diesel engine with a continuous output rating of 33 hp. at 1,800 rpm. The Model 190-DLCU portable power unit has a 3¾-inch by 4-inch, 265 cu. in. 6-cylinder diesel engine with a continuous output rating of 45 hp. at 1,800 rpm.

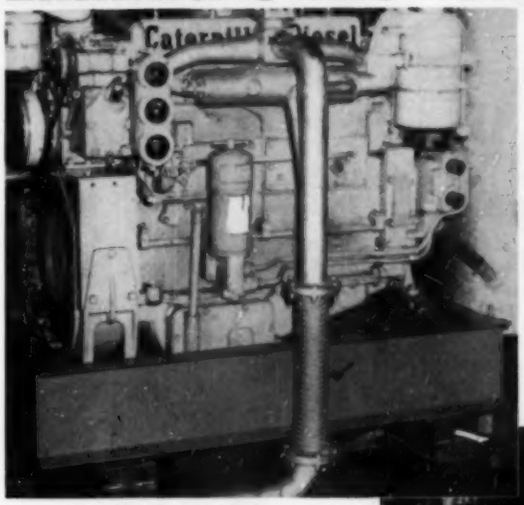
The three natural gas, butane, and gasoline, power units which are counterparts of the diesel units, and which have interchangeable mountings, may be supplied with either gas, gasoline, or combination gas-gasoline carburetors, and being high compression, overhead valve engines there is no other change than carburetor and timing adjustment needed when switching from gas to gasoline operation. The 4-cylinder Model 180-GLU portable power unit has a 3½-inch by 3¾-inch, 144 cu. in. gas or gasoline engine with a continuous output rating on either 1,000 btu. gas or 70 octane gasoline of 25 hp. at 1,800 rpm. The smaller of the two 6-cylinder portable power units, Model 185-GLU, has a 3½-inch by 3¾-inch, 216 cu. in. gas or gasoline engine with continuous output rating on either 1,000 btu. gas or 70 octane gasoline of 39 hp. at 1,800 rpm. The large 6-cylinder portable power unit Model 190-GLU has a 3¾-inch by 4-inch, 265 cu. in. gas or gasoline engine with a continuous output rating on either 1,000 btu. gas or 70 octane gasoline of 46 hp. at 1,800 rpm. In addition to their usable power outputs being interchangeable, as between diesel, gasoline or gas units, identical mounting dimensions of each size permit a machinery builder who adopts this line of power units to give his customers either a diesel, a gasoline, or a natural gas power plant with no alteration of the mounting base or drive. Likewise an owner may switch complete units in the field to whichever type of power plant is needed to utilize the most easily obtainable and most economical fuel in whatever locality his equipment may be put to work. The three diesels --one four and two sixes--are all of the special Waukesha type employing American Bosch injection equipment with single plunger pump, pintle type single orifice nozzles, and governor built into the fuel pump. The patented spherical combustion chamber, typical of all Waukesha diesels, is made in two sections: the lower section, which is air insulated from its seat in the head is a Stellite precision casting, while the upper section, which carries the injector, is entirely surrounded by liquid coolant, thus keeping injectors cool and in prime working order at all times. This patented combustion system is said to give exceptionally smooth running without shudder or clatter and at the same time it provides a quick, flexible response to power demands and throttle change. Good fuel economy of these engines is evidenced by their clean exhaust throughout their rated power and speed range.

Inside Information on Diesel Engines

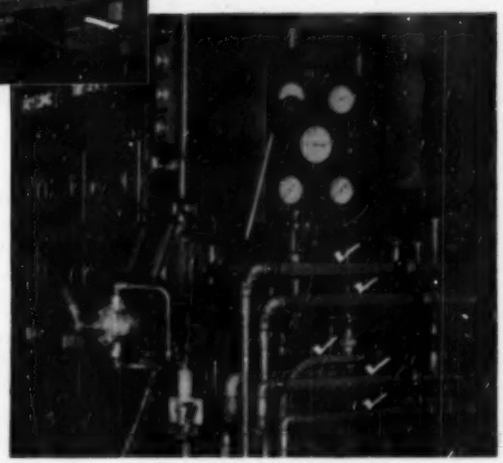
An important pamphlet describing the interesting "inside" information on diesel engines used in GMC trucks is being distributed to truck operators interested in a diesel unit, according to John E. Johnson, general sales manager for the GMC Truck and Coach Division. The pamphlet, written in the form of an information "Quiz," asks truckers such questions as "What is 2-cycle?" and then provides the correct answer: "In a 2-cycle, or 2-stroke cycle engine, every downstroke of the piston is a power stroke. There are no "pumping" strokes required to pull in fresh air or push out burned gases. A 2-cycle engine such as the GMC diesel, produces twice as many power strokes for each turn of the crankshaft as a 4-cycle engine. This results in a greater power output and smoother operation."

Answers also are given for such questions as "Are Diesels Hard to Start?", "What Is the Fuel Injection Pressure?", "Why Use a Governor?", "Are Diesel Exhaust Gases Poisonous?", "Why Aren't Diesels Used in Autos?", "Is the GM Diesel Supercharged?", and others. Truck operators may obtain copies of the diesel pamphlet by writing to a GMC truck dealer.

Eliminate the "Shakes" in . . .



✓ Exhaust Lines
✓ Oil Lines
✓ Fuel Lines
✓ Water Lines
✓ Air Lines



with CMH REX-WELD Flexible Metal Hose

There's no need to worry about the shakes in fixed piping connected to internal combustion engines if you use CMH REX-WELD Flexible Metal Hose assemblies. They effectively absorb vibration in exhaust, fuel, air, oil and water lines. By isolating vibration, maintenance is reduced, shutdowns minimized. Installation misalignment problems are solved, too.

CMH Rex-Weld is all-metal, corrugated flexible metal hose that is pressure and vacuum tight and highly resistant to fatigue. Rex-Weld Flexible Exhaust Connectors are available in all required sizes with choice of fitting attachments. Rex-Weld Flexible Metal Hose for fuel, air, oil and water is available in bronze or steel with couplings to meet your needs.

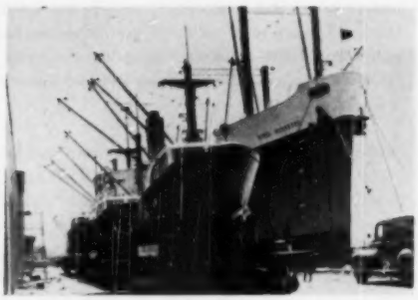
Write for data sheets today and ask about other CMH Flexible Metal Hose types.

Flexon identifies CMH products that have served industry for over 48 years

CHICAGO METAL HOSE Corporation
1325 S. Third Avenue • Maywood, Illinois • Plants at Maywood, Elgin and Rock Falls, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

CMH **ONE DEPENDABLE SOURCE**
for every flexible metal hose requirement

Diesel-Driven Water Taxis



The illustrations show three all-steel "Equity" 30-foot and one "Equity" 38-foot standard water taxis, diesel-driven, of all-steel construction. These four vessels were shipped recently to the Harbor of Haifa, Israel, for use by the Government of Israel Customs Authority. The 30-foot "Equity" water taxis are to be used as mooring launches and the 38-foot "Equity" taxi as a pilot boat.

The buying authorities surveyed the entire United States for suitable vessels and found that the "Equity" water taxis were idea for purpose. Furthermore, after a complete investigation, the "Equity" water taxis were found to be ruggedly constructed, with many outstanding features such as the one-piece streamlined automotive dished steel top, aluminum framed windows, stainless steel trim and chrome plate lights and fixtures, diesel-driven with hydraulic shift and finger tip control, affording one-man operation, corrosive resistant diamond tread aluminum floor plate in cockpit, heavy pipe stem extending to the end of the large keel, safety glass for windows and windshield, and many other features.

The "Equity" water taxis are ideal crewboats. Being diesel-driven and of all-steel construction, they are safe and offer no fire hazard. These diesel vessels are fast and afford perfect maneuverability. Maintenance is a minimum. These vessels are structurally sound and inherently stable and seaworthy. They are a standard product with proven performance. They meet all the requirements of the American Bureau of Shipping for such vessels. Equitable Equipment Co., Inc., designers and builders of "Equity" standard floating equipment, will be glad to furnish complete details on these or any other floating equipment to suit your needs.

Diesel Order for Baldwin

The Baldwin Locomotive Works, Eddystone, Pennsylvania, has announced the receipt of an order from The Pennsylvania Railroad for a total of 108 diesel-electric locomotive units. Comprised in this total are sixty 1,600-hp. road units, six 800-hp. switchers, nineteen 1,200-hp. switchers, nine 1,600-hp. all-service locomotives, and fourteen 2,400-hp transfer locomotives. All of these various locomotive types are part of the new standard line of diesel-electrics with increased horsepower and tractive effort ratings recently announced by Baldwin.

Catalog — Volume Fifteen

The 15th volume of the DIESEL ENGINE CATALOG is now available to the industry. A complete revision of volume fourteen, with many new engines, many new models, many old models re-rated. In this volume fifteen you will find every diesel engine, every dual-fuel engine and every natural gas engine actively manufactured and sold in these United States, technically and completely described and illustrated. Plus a large and very important accessory equipment section. Truly described as the Bible of the industry, this volume fifteen of the DIESEL ENGINE CATALOG can be obtained by mailing $10.00 to DIESEL PROGRESS, P. O. Box 8458, Los Angeles 46, California.

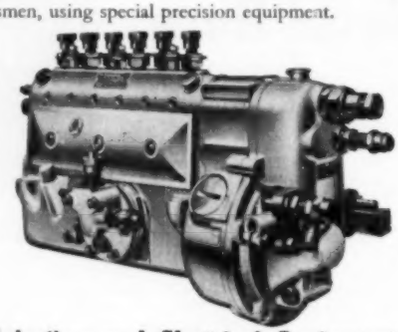
C.A.V. LIMITED SERVICE

Confidence Abroad

Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney — there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



C.A.V. Fuel Injection and Electrical Equipment

Service Depots throughout the World

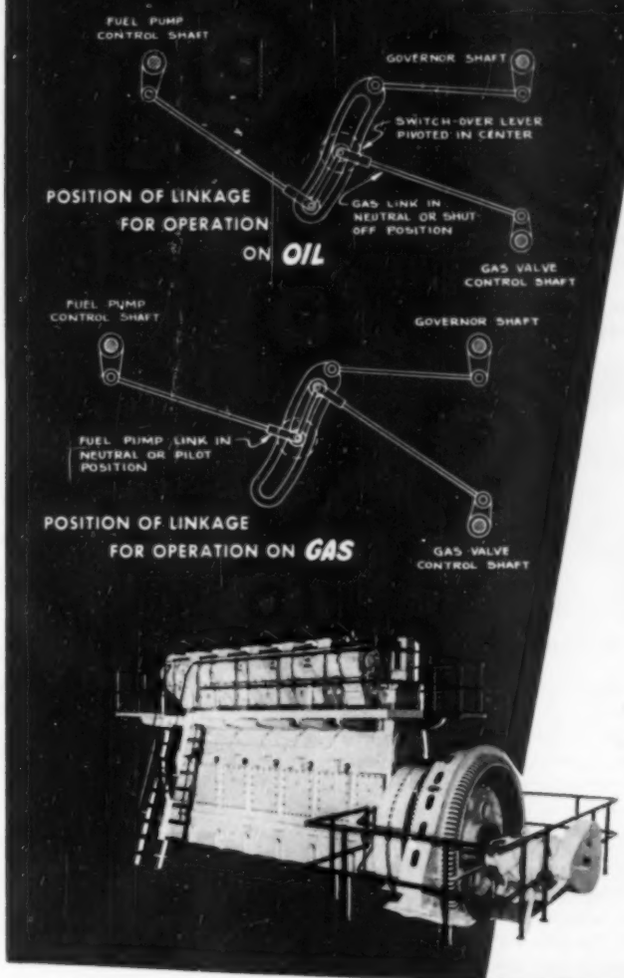
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., NEW YORK 19, N. Y.

Sales Office:
14820 DETROIT AVENUE, CLEVELAND 7, OHIO

now far faster, 2-second changeover!
far more sensitive speed control!
far more dependability!

*WITH NEW PATENTED**

FULTON DUAL-FUEL


FUEL PUMP CONTROL SHAFT
GOVERNOR SHAFT
SWITCH-OVER LEVER PIVOTED IN CENTER
POSITION OF LINKAGE FOR OPERATION ON OIL
GAS LINK IN NEUTRAL OR SHUT OFF POSITION
GAS VALVE CONTROL SHAFT
FUEL PUMP CONTROL SHAFT
GOVERNOR SHAFT
FUEL PUMP LINK IN NEUTRAL OR PILOT POSITION
POSITION OF LINKAGE FOR OPERATION ON GAS
GAS VALVE CONTROL SHAFT

SUPER-SIMPLE SWITCHOVER UTILIZING FULL GOVERNOR STROKE ON BOTH OIL AND GAS

(any ratio of oil and gas obtainable)

The diagrams tell the story. No other dual-fuel engines offer you anything like the simplicity, speed and efficiency of this exclusive FULTON feature. What's more:

- you can change instantly to either fuel by PUSH-BUTTON REMOTE CONTROL... from your office seat or at mutiple control points anywhere in the plant;
- if line gas pressure drops, FULTON DUAL-FUELS *automatically* switch to oil. We invite your inquiries on these years-ahead FULTON advancements.

* U. S. Patent No. 2509960

FULTON

FULTON IRON WORKS CO.
SAINT LOUIS 14, MISSOURI

W. G. B. OIL CLAR-O-FICATION Costs Less BECAUSE IT Keeps Oil Cleaner Longer

And Here's Why:

1. *Exclusive . . . Patented Oil Distributing Support* makes W. G. B. Cartridges more efficient . . . more economical.
2. *Unusual Design Features* provide great filtering area — *combined with absorption.*
3. *No Tools Required* to change W. G. B. Cartridges.
4. *Adequate Sediment Chamber,* which is easy to drain.
5. *⅛-Inch Steel Construction* makes W. G. B. Clar-O-Fiers practically indestructible.

Dirt and Dust Make W. G. B. Oil Clar-O-fication a Must!

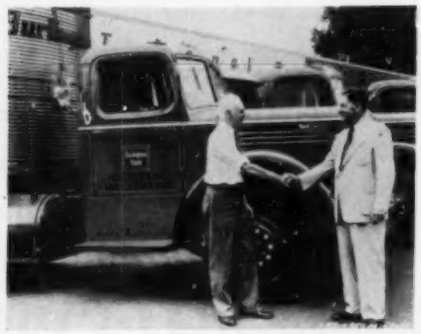
Summing up: W. G. B. delivers the maximum in oil clar-o-fication — with an absolute minimum of service time and costs. No two ways about it — W. G. B. gives you more per dollar . . . rates first place as today's most outstanding oil filtration *buy!* Write for name of W. G. B. representative nearest you.

Distributors Wanted

A few select territories are still available to Distributors who specialize in serving the Construction Industry. Your inquiry will receive prompt attention.

W. G. B. OIL CLARIFIER, INC.
KINGSTON, NEW YORK

Railroad Adds Macks to Its Trucking Line



Five new Mack LFT diesels have been delivered to Burlington Truck Lines, Inc., wholly-owned subsidiary of the Chicago, Burlington & Quincy Railroad. Here, Warren Taussig (left), vice president and general manager of the truck line, accepts delivery of the trucks from Dick Meinert, Mack Truck fleet manager. The Burlington Route uses its extensive trucking subsidiary to augment and supplement its regular rail service. The new diesel trucks are part of the line's modernization program and are being placed in service between Galesburg and Chicago, Illinois.

Enterprise Names Barthmaier and Goodwin

James E. Barthmaier — Hugh H. Goodwin

Enterprise Engine & Machinery Co. has announced the appointment of James E. Barthmaier as district manager of diesel engine sales and service for its New England territory, with headquarters at Boston. Simultaneously, Enterprise announced the appointment of Hugh H. Goodwin as sales engineer for its New York branch.

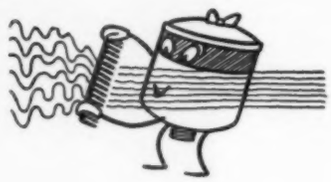
Barthmaier, recently district manager for Superior Engine Division of National Supply Company in Boston, has been associated with the engine field since 1936. Goodwin was also with Superior, filling the post of sales engineer in the New York area since 1940, except for a year with Sterling Engine Company. Prior to 1940, he was in the export division of Fairbanks, Morse & Co. in New York.

ABOE, Inc., Moves to New Offices

Removal on Monday, October 9, of the New York offices of ABOE, Inc., from 57 Park Avenue to the Empire State Building, was announced here by Ronimund Bissing, company president. The move, he said, will provide larger quarters and better facilities for servicing the company's steadily expanding business.

AIR-MAZING FACTS

DAYLIGHT IN A FLASH! At sun-up, night would turn into bright daylight *instantaneously* if it weren't for dust. Dust particles high up in the atmosphere catch the light while the sun is still below the horizon, reflect it down to earth, give us our dawn.



STRAIGHTENS WAVY AIR! The noise you hear when air swishes through an intake is due to vibration — pressure waves in the air. By eliminating most of this vibration, Air-Maze filter-silencers reduce noise, please the neighbors, help workers do a better job.

FOILED IN OIL! Dust and dirt that try to slip into a compressor or engine through the air intake don't get away with it when an Air-Maze oil bath filter is on the job. Oil-bath filters scrub air clean in a bath of oil, greatly reduce wear on pistons, cylinders and rings.

WHETHER YOU BUILD OR USE engines, compressors, air conditioning and ventilating equipment, or *any device using air or liquids* — the chances are there is an Air-Maze filter *engineered* to service you better. Representatives in all principal cities, or write Air-Maze Corporation, Cleveland 5, Ohio.

AIR-MAZE
The Filter Engineers

AIR FILTERS
SILENCERS
SPARK ARRESTERS
LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

58th Annual Meeting of the SNAME

The 58th Annual Meeting of The Society of Naval Architects and Marine Engineers will be held in New York City on November 8th to 11th, 1950, at The Waldorf-Astoria. Following a Council meeting on the first day, the next two days will be devoted to technical sessions at which members will hear and discuss nine papers prepared by prominent experts in their fields. Morning and afternoon meetings have been arranged for each day when members of the nation's shipping and shipbuilding industries and allied trades, drawn from all sections of the country, will receive the following technical papers:

"An Approximate Theory of Heavily Loaded, Free-Running Propellers in the Optimum Condition," by Dr. Hermann W. Lerbs, of the David Taylor Model Basin.

"On the Motions of Ships at Sea," by Dr. Georg P. Weinblum and Manley St. Denis, of the David Taylor Model Basin.

"Cooling Effect of Tube Holes in Thick Shells of Marine Boilers," by J. F. Harvey, of The Babcock and Wilcox Company.

"The Backing Power of Geared-Turbine Driven Vessels," by E. F. Hewins, of Newport News Shipbuilding and Dry Dock Company, and H. J. Chase and A. L. Ruiz, of General Electric Co.

"Design-Stage Calculations of Torsional, Axial and Lateral Vibrations of Marine Installations," by Eugene Panagopulos, of E. P. Panogopulos and Associates.

"Bearings and Lubrication for Marine Turbines and Reduction Gears," by Frank C. Linn, of General Electric Company, and Professor John T. Burwell, of Massachusetts Institute of Technology.

"Standards for Stability of Ships in Damaged Condition," by Vito L. Russo, of the Maritime Administration, and James B. Robertson, Jr., of the United States Coast Guard.

"Stateroom Fire Test," by Lieutenant Commander Archibald H. McComb, U.S.C.G., and Edwin E. Benzenberg, of Gibbs & Cox, Inc.

"Some Aspects of Ship Bottom Corrosion," by Paul Field, of Bethlehem Steel Company, Shipbuilding Division, Quincy, Massachusetts.

A Railroad President's Prayer

Basic points and practices essential to the establishment and perpetuation of successful diesel locomotive operation are complete freedom from prejudice and a full acceptance of the new type power and most important, the will to maintain a new type power properly and to inculcate in all subordinates the same ideas. This includes the establishment of many sound practices new to steam men and the abandonment of many old practices of a traditional nature.

Proper education of personnel and the insistence upon supervision and subordinates alike, including road foremen of engines, commonly called traveling engineers, and the enginemen themselves that the work be thoroughly and properly done. Included in this education is the necessity of following recommendations of manufacturers and supply representatives until such time as experience and other knowledge gained from the operation dictate otherwise. Also, included in this education during the transition from steam to diesel power is the teaching of all personnel to keep their work, their surroundings, and themselves clean. They must be taught and supervision must insist on thorough work of a perfunctory nature is the source of most of our maintenance troubles, and deviation by enginemen from recommended practices for handling of equipment on the road is another great trouble source.

A complete and dependable record system is most essential. In our opinion, a diesel maintenance operation cannot be carried on successfully when dependence is placed on the memory of individuals or pocket records. Such a record should be one so set up and maintained that reference can be made to such records at any time during the 24-hour period of each day, and the information desired readily located.

DIESEL ENGINE CATALOG is just off the press in its Fifteenth Edition. Completely revised and up-to-date, it is invaluable to design engineers and buyers. ORDER COUPON ON PAGE 70.

Lowest Cost **POWER** *for Golden Lumber*

WITH STRAIGHT EVAPORATIVE

VAPOR PHASE

★ No Troublesome Fans, Fan-Belts, Radiators or Costly Cooling Towers

For three years now, Golden Lumber Co. has enjoyed the lowest cost power for lighting and lumber manufacturing operations in the rugged timber region of Annapolis, California.

Straight Evaporative Vapor Phase, installed on a reconditioned Fairbanks-Morse 4 cycle 350 HP Diesel engine, is the reason. It permits use of a minimum amount of relatively soft, raw make-up water from a nearby creek and eliminates need for troublesome fans, belts, radiators or costly cooling towers.

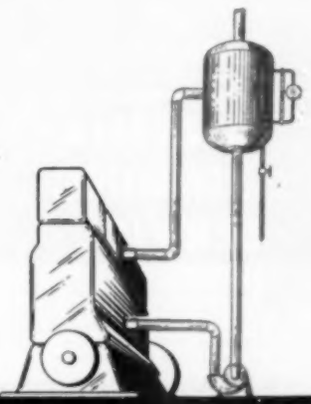
Vapor Phase converts old or new engines into efficient power units unaffected by temperatures or ambient conditions and requiring minimum attention. It reduces engine operating and maintenance costs (see following report) and has proven, by far, the *lowest cost* system in every way—first cost, operation and savings accrued.

Low Cost Vapor Phase & Power System, Golden Lbr. Co.

HERE'S THE RECORD

Golden's manager, William B. Allen, reports this engine has delivered consistent, dependable power service with lower fuel and oil consumption and no major repairs since Vapor Phase was installed three years ago. Lube oil shows clean at each 400 hrs. change period—filters changed each 6 months only.

AND MORE! A recent 7000 hrs. preventive engine maintenance overhaul showed cylinder liner wear less than .005—no corrosion—rings free—lube oil sludging and water jacket scaling negligible.



VAPOR PHASE pays off in Savings alone, the first year. The unit costs nothing to operate and is good for life.

VAPOR PHASE *Serves Many Varied Needs*

Vapor Phase equipped engines *also* serve the multi-purpose job of generating steam, heating water, fluids, space or other process (including cooling or heating through air conditioning systems)—each as required or all at the same time, for the cost of engine operation *only*. Imagine the saving!

BEFORE YOU BUY AN ENGINE OR MAKE COSTLY POWER CHANGES — CONSULT A VAPOR PHASE ENGINEER

Offices in Most Principal Cities

ENGINEERING CONTROLS, Inc.
2835 East Eleventh St., Los Angeles 23

There is PERFECT CONTROL

For your automatic engine . . .

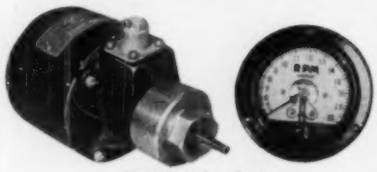
SYNCHRO-START CONTROLS are unequalled in performance, economy, safety, dependability and protection.

Eighteen years of manufacturing controls, ranging from a simple switch to multiple engine control panels, have given SYNCHRO-START the "know-how" to make a thoroughly DEPENDABLE CONTROL.

When you order your engines—SPECIFY SYNCHRO-START controls. Your manufacturer, dealer, engineering firm, or architect can furnish you with the correct control. Or write us direct.

SYNCHRO-START PRODUCTS, INC.

New . . .
ELECTRIC
TACHOMETERS
Simplified RUGGED Design!



Precision at Low Cost!
A quality precision tachometer unit engineered to your specifications with scales calibrated to your requirements. Elimination of wearing parts assures sustained accuracy. Non-directional or indicating forward and reverse.
PRICE: $36.00 AND UP
WRITE FOR HELPFUL BULLETIN
The ELECTRO-MECHANO Co.
161 EAST ERIE ST. MILWAUKEE 2, WIS.

Have you tried the amazing
NEW FRAM LUBRI-GRAF?
. . . provides a continuous visual check on the condition of the oil and filter cartridge in every vehicle you operate. Write for free sample today! FRAM CORPORATION, Dept. D-11, Providence 16, R. I.

Specify **ADECO**
FOR DEPENDABLE FUEL INJECTION EQUIPMENT
ADECO
YOUR STAND-BY FOR Fuel Injection Equipment and Replacement Parts for Maintenance
ADECO PRODUCTS, INC.
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NEW YORK DISTRIBUTOR: SEVEN SEAS SUPPLY CO.
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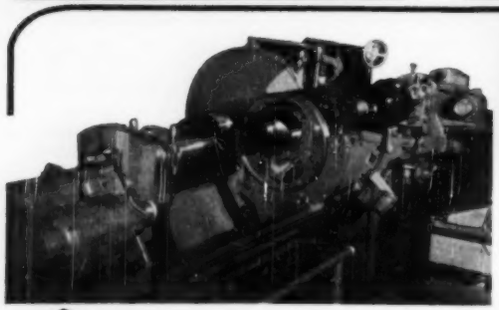
Throughout the Power Industry-
Aerofin Fin-Type Heat-Transfer Units do the job Better, Faster, Cheaper.....
AEROFIN CORPORATION
810 South Geddes St., Syracuse 1, N. Y.



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Four machines giving range from the smallest up to crankshafts with stroke of 15½" and 200" O.A.L. Complete grinding service for locomotive, stationary, marine, automotive and compressor crankshafts.

• **MAGNAFLUX INSPECTION** •
Prompt Service . . . Accurate Work
Established 1924 . . . 26 years experience grinding crankshafts! The most complete engine rebuilding shop in the Southwest!

THE LARGEST CRANKSHAFT GRINDING MACHINE IN THE WORLD USED IN AN INDEPENDENT REPAIR SHOP

NATIONAL WELDING & GRINDING CO. 2939 CANTON ST. DALLAS 1, TEXAS

New Catalog on Flexible Metal Hose

Catalog 500 on flexible metal hose which has just been issued by the Atlantic Metal Hose Co., Inc., 123 West 64th Street, New York 23, New York, should prove a valuable working tool in design and maintenance departments, since it contains the latest data compiled by the company's engineers. David M. Fuchs, head of the sales department, states that Catalog 500 employs a new method of compartmentalizing data so that cross-references and foot-notes are completely eliminated. Design and maintenance engineers, and all those using and supplying flexible metal hose, can secure complete application and construction data without loss of time.

Section one includes flexible metal interlocking high pressure hose, air jacketed hose for diesel exhausts, and conveyor hose for ventilating and exhausting. The second section refers to flexible metal seamless high pressure hose and diesel exhaust hose. Section three is concerned with metal lined gasoline hose and synthetic rubber gasoline hose. Couplings applicable to the various hose comprise the last section. Of great value are the U. S. Navy Department test table for bronze and steel hose; data on bending diameters, hydrostatic bursting pressures, and the series of installation diagrams. Inquiries concerning Catalog 500 should be addressed to Mr. David M. Fuchs at the Atlantic Metal Hose Co., Inc.

New Catalog by Alco

Alco Products Division of American Locomotive Company has published a new 16-page catalog containing a fund of useful product information about heat exchangers, evaporators, feedwater heaters, pressure vessels and pipe. The booklet, for example, shows how the diameter and length of a heat exchanger unit is selected by using the unique Alco "MTD" Calculator and a selector table. Another part of the booklet tells how a helpful template for making piping layouts can be obtained. It is packed full of "how-it-works" information, and design and selection data. There are over 60 cutaway and cross-sectional drawings of heat exchangers, evaporators and feedwater heaters.

In addition to descriptions of the regular shell and tube line of heat exchangers, Alco has included expanded sections on its new industrial exchanger and the Alco Aircooler. A spread on production facilities, and pages of photos showing a variety of Alco installations throughout industry are other features. For a copy of Catalog AL-3, write on your letterhead to Public Relations Department, American Locomotive Company, Schenectady, N. Y.

Yuma, Arizona

In the February issue of DIESEL PROGRESS we described, in some detail, the Yuma, Arizona, power plant of the Arizona Edison Company. At that time the plant consisted of an 8-cylinder and a 16-cylinder Model LSV-16 Cooper-Bessemer dual fuel engine. Word comes, as we go to press, that the Arizona Edison Company has just signed a contract for two more LSV-16 Cooper-Bessemer dual fuel units.

YOUNG "HC" HORIZONTAL CORE

ECONOMY PLUS VERSATILITY IN

WATER, OIL, GAS COOLING... STEAM & VAPOR CONDENSING

Basic "HC" Unit may be used in multiples for greater cooling capacity or combination of services.

IMPORTANT FACTS ABOUT THE "HC"

- LOW COST—small initial investment, economical maintenance.
- VERTICAL AIR DISCHARGE—eliminates cross wind effects.
- HIGHLY EFFICIENT—airfoil section fan.
- MULTIPLE INSTALLATIONS—provide greater capacity, combined services.
- NO VIBRATION—adjustable pitch fan mounted separately from unit.
- LARGE CAPACITY—water cooling, from 600,000 Btu/hr up; oil cooling, from 20,000 Btu/hr up.
- LOW HP REQUIREMENT—1 to 10 hp per fan.
- EASY INSTALLATION—simplified piping and frame construction.
- CORE GUARD SCREEN—protects cores from falling objects.

• Here is another development by Young providing high efficiency cooling and condensing at low initial and operating costs. The Dual coil "HC" is designed for water and lube oil cooling. Manifolds are available for all types of coils. Four sizes, with 2, 4, 6 and 8 coil installations, provide exceptional versatility in heat transfer service. The 4 or 6 blade fan, serving each two coil unit, may be mounted directly on the fan motor shaft, or powered by a v-belt or gear speed reducer drive. Full details about the new "HC" Units, or other Young Heat Transfer Products, are available on request.

YOUNG HEAT TRANSFER PRODUCTS

T. M. REG. U. S. PAT. OFF.

YOUNG RADIATOR CO.

General Offices: Dept. 400-L, Racine, Wis.
Plants at Racine, Wis., and Marion, Ill.

OIL FIELD, HEAVY INDUSTRIAL, MUNICIPAL & CHEMICAL PROCESS COOLING EQUIPMENT
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Gas, gasoline, Diesel engine cooling radiators • Heat exchangers • Intercoolers • Oil coolers • Supercharger intercoolers

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Convectors • Unit heaters • Heating coils • Cooling coils • Air conditioning units • Evaporative condensers

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Oil coolers • Supercharger intercoolers • Radiators • Heat exchangers • Valves • Regenerators

DISTRIBUTORS • The Happy Company, 310 E. 10th St., Tulsa 1, Oklahoma. A. R. Flournoy Co., 5043 Santa Fe Ave., Los Angeles 11, California. H. J. Young, 1364 Lake Shore Drive, Muskegon, Michigan. Others in Principal Cities.

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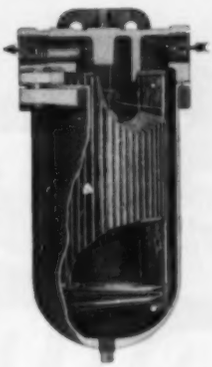
Results Prove It

the Finest Name in Filtering

Nine times out of ten ***Bendix-Skinner*** Filters will supply the "finest" answer to your filtration problems. Here are the facts: available with patented, exclusive, resin impregnated cellulose elements; simple, quick replacement; high flow rate with minimum pressure loss; no channeling or bypassing; over 350 models providing filtration from ½ micron (.000019") upwards at flow rates from 1 to 5000 g.p.m. Why not let ***Bendix-Skinner*** filtration engineers work with you? Write us direct.



Model 3110-P filter element, 6¼" x 3⅛", has a filtering area of 940 sq. in.!

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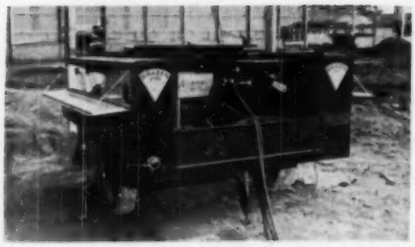
DETROIT 11, MICHIGAN

Bendix AVIATION CORPORATION

Export Sales: Bendix International Division 72 Fifth Ave. N. Y. 11, N. Y.

New Power Units



Development of two special power units, specifically designed for use with Nelson stud welding equipment, was announced recently by George E. Gregory, president of Morton Gregory Corporation. One unit is a motor-operated generator set capable of welding studs up to and including ⅝-inch in diameter. The other is a specially designed battery-operated unit which can be used for installing studs up to ½-inch in diameter with the Nelson automatic stud welding gun. "These two machines have been developed to improve and extend the cost-saving advantages of stud welding," said Gregory. "Both units have been designed to provide an adequate, dependable power source for stud welding under all operating conditions. The new power unit is superior to 600-amp. generators now available and is particularly effective for welding studs up to ⅝-inch in diameter. The battery unit represents an excellent source of reliable power for stud welding wherever the voltages required for the operation of generators is not available."

In stud welding performance, the Nelson power unit is equivalent to two conventional 400-ampere generators in parallel, although its cost is approximately one-third less than the two units. The compact unit is comparable in size to a 200-amp. welding generator and weighs approximately 800 pounds. Either 220-volt or 440-volt, 60-cycle alternating current can be used with the new power unit. The Nelson stud welding battery unit, requiring only a 110-volt a-c convenience outlet for its operation, is particularly useful for construction jobs where welding generators or necessary power are not available, and for plant maintenance operations. This unit consists of twelve 6-volt, 150-ampere top quality wet storage batteries securely mounted on a strong frame and covered with an easily-raised hood. Wheels are optional equipment. An automatic battery charging device is mounted on top of the hood. The unit weighs aproximately 1,100 lbs. and, when used on construction work, may be conveniently moved on a trailer or pickup truck. Both of the new units were exhibited at the National Metal Exposition in Chicago, October 23-27. They will be sold through Nelson authorized dealers located in principal cities, and the Nelson Stud Welding Division, Lorain, Ohio. For further informtion, write DIESEL PROGRESS, File 67, P. O. Box 8458, Los Angeles 46, California.

Synchro-Start Starts Building New Plant

W. J. Williams, president, announces that ground was broken September 18th for the erection of the first unit of their new modern factory building to be located 15 miles northwest of the Chicago Loop in the village of Skokie. This unit will house the main offices and final assembly with the fabricating remaining in other plants as before until additional space can be built. The company manufactures automatic engine control equipment, demand for which necessitates the expansion. It is expected the main offices will be able to move about February 1, 1951.

A NEW AND BETTER DIESEL OIL

D-X

DHD MOTOR OIL

with EXTRINOL

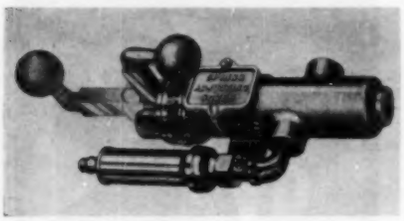
Meets Rigid U. S. Specifications MIL-2-104

YES, D-X DHD is a step ahead in lubrication protection for Diesel owners and operators. It is specially reinforced with Extrinol, the D-X "extra" that increases protection for bearings, increases heat resistance, prevents foaming and fights sludge and varnish formation. Try D-X DHD Motor Oil with Extrinol in your Diesels. You'll find that it stands up longer, lubricates better and helps you cut lubrication costs. Try D-X DHD on the famous D-X Trial Bond. Your satisfaction is guaranteed or your money back! Call your nearest D-X distributor, or write direct.

MID-CONTINENT PETROLEUM CORPORATION
TULSA, OKLA.

Waterloo, Ia. Terre Haute, Ind. Omaha, Nebr. Chicago, Ill. Minneapolis, Minn.

New Low Oil Pressure Alarm



A new low pressure alarm designed to give positive warning when lube oil pressure fails has been developed, and is now being distributed, by Mid-Continent Supply Company. The new whistle type alarm is made from sturdy cast bronze and stainless steel and will fit any make or type of engine. It gives a shrill and positive warning when the lubricating oil pressure fails for any reason. Operation of the alarm is wholly automatic and the installation is extremely simple. It is easily attached to the engine block or any other convenient location and is put into operation by attaching the air line and the lube oil pressure line to the points marked on the unit.

If the lube oil pressure fails, the piston in the cylinder is retarded enough to permit the air to pass through and operate the whistle which will sound until the lever is flipped into the vertical position. This gives the operator a simple, automatic and positive warning. Use of the whistle alarm in any desired location is easily accomplished by the use of Aeroquip flexible hose and connections. The unit is completely weatherproof and may be mounted without regard for weather conditions. The Mid-Continent low pressure alarm is now available through any store or sales office of the Mid-Continent Supply Company. For further informtion write DIESEL PROGRESS, File 71, P. O. Box 8458, Los Angeles 46, California.

Cooper-Bessemer Adds to Field Staff

Clayton L. McDougall

The apointment of Clayton L. McDougall as sales and engineering representative to its Odessa, Texas, office, was recently made public by The Cooper-Bessemer Corporation. Mr. McDougall is a graduate engineer from the University of Cincinnati and has been associated for over six years with this engine and compressor builder at its headquarters plant in Mt. Vernon, Ohio. His assignment to this Odessa field office, under the direction of Arthur W. Abel, Jr., branch manager, is being made with the purpose of further increasing Cooper-Bessemer's engineering service to the petroleum industries. His sales engineering duties will concentrate on gas and diesel engines, engine-driven compressors and liquid pumps for petroleum processing and transmission service.

DIESEL ENGINE CATALOG is just off the press in its Fifteenth Edition. Completely revised and up-to-date, it is invaluable to design engineers and buyers. ORDER COUPON ON PAGE 70.

New Plant for Caterpillar

First steel erection at the new Caterpillar Tractor Co. plant at Joliet, Ill., has started, according to T. R. Farley, vice president. The new plant at Joliet marks an additional expansion of manufacturing facilities with which it is planned to achieve the greatest possible economy in the manufacture and distribution of Caterpillar products. In addition to its main plant at Peoria, Illinois, Caterpillar has a factory and parts depot at San Leandro, California, and parts depots at Kansas City, Kansas; Atlanta, Georgia; Shreveport, Louisiana; Albany, New York; Minneapolis, Minnesota; Spokane, Washington; and Indianapolis, Indiana. It is planned that final assembly operations from component parts produced by Caterpillar and the present subcontractors will start in the Joliet plant even before the building is completed and the necessary machinery for fabrication is installed. The Joliet site is suited ideally for the manufacture, assembly and shipping of earth-moving equipment. While the cost of the facilities, which will include a modern steel fabricating and assembly building, an office building, a heating plant and soluble oil and water treatment plants, was not disclosed, it is understood that it involves the expenditure of several millions of dollars. The manufacturing facilities will cover approximately 700 thousand square feet of floor space and it is estimated that sixteen to seventeen hundred people ultimately will be employed in its operation.

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CYLINDER LINERS BY
CWC
✓Excellent — material and dimensional consistency assured by permanent mold casting process.
✓Excellent — machinability with high Brinell.
✓Excellent — wear resistance due to uniformity and density of material structure.
✓Excellent — resistance to corrosion through the use of alloys.
Write for our new brochure SCIENCE IN THE FOUNDRY. It gives complete information on centrifugally cast cylinder liners and on all other CWC products such as: cast cylinder blocks and heads; cast pistons; cast camshafts; cast crankshafts; cast gears; centrifugally cast Centrifuse brake drums; and a large variety of steel castings.
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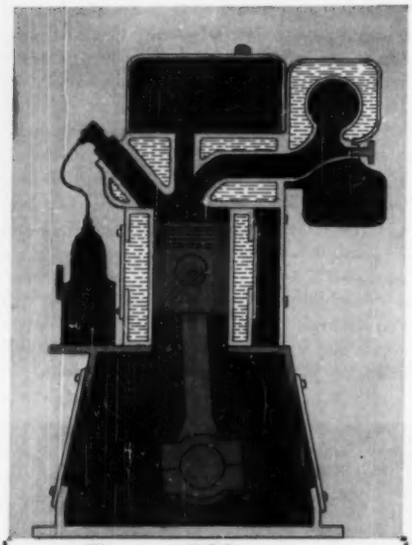
MUSKEGON, MICHIGAN
CAMPBELL, WYANT AND CANNON FOUNDRIES
MUSKEGON, MICHIGAN
Henry Street Plant • Sanford Street Plant • Broadway Plant
LANSING, MICHIGAN • Centrifugal Fusing Co.
SOUTH HAVEN, MICHIGAN • National Motor Castings Div.
CWC



Easy Way to Descale Jacket Water Coolers and Cooling Systems

DID you know you can remove lime-scale and rust accumulations from the water-sides of your Diesel jacket water coolers and other heat exchange units without dismantling equipment? It's a fact when you use Oakite Compound No. 32!

Simply circulate recommended solution of this scientifically-designed Oakite inhibited-acid compound through cooling system. Without damaging the metal, Oakite Compound No. 32 quickly, thoroughly removes scale and rust . . . restores heat exchange efficiency, with very little downtime.

Available to responsible persons is a 16-page illustrated Manual containing many practical ideas for expediting Diesel maintenance . . . keeping Diesel operation costs low. Up for discussion are such subjects as:

- **Filter Cleaning**
- **Cleaning before Overhaul**
- **Cleaning inter-coolers**
- **Steam-Detergent Cleaning of hard-to-reach areas**

You are invited to send for this Manual. There is no cost or obligation. Simply drop a line to address below—your copy will be mailed immediately on request. Ask for Manual No. 5874.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

OAKITE PRODUCTS, INC., 210 Thomas St., NEW YORK 6, N. Y.
Technical Service Representatives in Principal Cities of U. S. & Canada

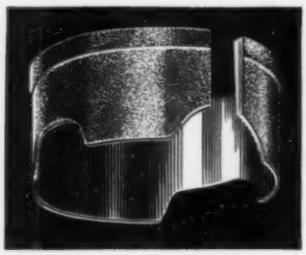
New President of Buda

At a meeting of the board of directors of the Buda Company recently, a new president was elected to succeed the late J. S. Dempesy. According to S. S. Hathaway, chairman of the company, R. K. Mangan, who for the past 12 years has been executive vice president, becomes president, while K. E. Fitzpatrick, secretary of the company, succeeds Mr. Dempesy as treasurer of Buda.

Mr. Mangan came to the Buda Company in 1917 after receiving his mechanical engineering degree at the University of Illinois. He started as a mechanical engineering apprentice, but during the years held numerous position within the company. He has travelled widely for Buda, in foreign countries and in the United States, and during World War II directed many operations when Buda expanded to more than 5,000 employes and four plants.

Mr. Fitzpatrick came with Buda in 1939 as comptroller and has been secretary of the company for 10 years.

New Ring Inserter



Herbrand's new ring inserter has just been announced by Herbrand Tools, of Fremont, Ohio. Three finger openings are provided so each ring may be guided into the groove in the piston while pushing the piston into the cylinder. Small slotted section in the wall of the tool permits expansion for installation of pistons and rings up to .060 oversize. Specially designed to handle the new U-Flex as well as all other types of rings. It is claimed that this tool will save up to 50 per cent of the time it takes to compress and insert rings and pistons. For further information write DIESEL PROGRESS, File 72, P. O. Box 8458, Los Angeles 46, California.

Regional Manager of Purolator

R. C. Swenson, Jr., has been appointed regional manager of Purolator Products, Inc., with headquarters at the Purolator offices, 122 South Michigan Avenue, Chicago. Announcement of the appointment was made by Howard Hopkins, manager, jobber division. Mr. Swenson resigned from the government service, where he was materials engineer in the industrial manager's office of the 9th Naval District, in order to come to Purolator.

During the war Mr. Swenson served in the Navy, aboard the *U.S.S. Mt. Vernon*, and as director of Communications at the Navy Pier, where he taught at the Naval Aviation Machinists Mates School. He also wrote the curriculum for the Communications School, Communications Manual for officers, and the scripts for two instructional films for the Navy Department.

SPECIFY

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dye penetrant metal inspection

Simplified Non-Destructive Testing . . .
Any Metal— Anywhere

FASTER,
CHEAPER,
MORE ACCURATE

Completely Portable, License-Free

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The Answer to Diesel Liner Wear.

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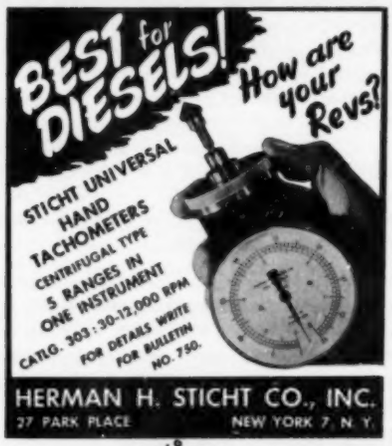
OF AMERICA • OLEAN, N. Y.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How are your Revs?
STICHT UNIVERSAL HAND TACHOMETERS
CENTRIFUGAL TYPE
5 RANGES IN ONE INSTRUMENT
CATLG. 303 : 30-12,000 RPM
FOR DETAILS WRITE FOR BULLETIN NO. 750.

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FOR COMPLETE PURIFICATION OF USED OIL

The Hoffman Oil Conditioner saves lube oil by removing solubles and insolubles—saves centrifuge maintenance costs. Capacities of 50 to 800 g.p.h. Write for Bulletins A-647 and A-648.

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Specify Precision
TITUSVILLE
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DIESELS for operating ECONOMY

The present day trend toward diesels — both for new installations and for replacements — is largely due to operating economy and dependability.

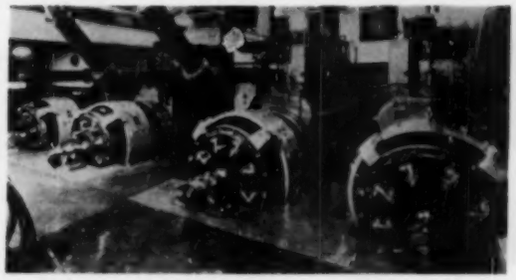
Current installation practice is to mount them on Korfund Vibro-Isolators.

This makes it possible to install diesels anywhere with positive assurance that there will be absolutely no transmission of objectionable vibration. Additional benefits include savings from reduction of building and engine maintenance costs, and frequently the elimination of concrete foundations.

Vibration is absorbed by steel springs which provide the finest isolating medium available. Thrusts are controlled by resilient checks in the four corners.

The result is smoothed, floating operation at all speeds — in marine, mobile, or stationary installations. The cost is low. Ask for Bulletin G-102. Representatives in principal cities.

The Korfund Company, Inc.
48-20B 32nd Place, Long Island City 1, N. Y.



FOUR OF FIVE DIESEL GENERATORS—TWO PARK AVE. OFFICE BLDG., N.Y.C.
Four Worthington 6-cylinder, 450-H.P. diesel generators on two foundations supported by 24 Korfund Vibro-Isolators. An additional 750-H.P. Supercharged Worthington unit installed at later date on Korfund-isolated foundation. Note flexible pipe connections and floor plates over isolators. Korfund Vibration Control permitted economical diesel power generation without vibration transmission in this busy office building.

A FEW TYPICAL INSTALLATIONS

City of Seattle Fire Boat *Duwamish*
3—930 hp. Cooper-Bessemer.
Chicago & North Western Railway System
3—275 hp. Sterling.
Bangor Hydro-Electric Co., Bangor, Maine
6—1425 hp. Nordberg.
Floyd Bennett Field, New York
1—450 hp. Fairbanks-Morse.
Lenox Hill Hospital, New York
1—750 hp. Worthington.
Lone Star Gas Co., Dallas, Texas
1—600 hp. Cooper-Bessemer.
Sun Oil Co., Marcus Hook, Pennsylvania
4—250 hp. Ingersoll-Rand.
City of Oklahoma, Oklahoma City, Oklahoma
7—210 hp. and 3—175 hp. Worthington
Namm Department Store, Brooklyn
4—300 hp.; 1—180 hp.; 1—130 hp. Worthington.
Cia Central Argentina De Electricidad, Buenos Aires, S.A.
1—270 hp. Sulzer; 3—540 hp.; 1—700 hp. Deutz.

KORFUND for operating SMOOTHNESS

See us in Booth No. 110 at the Plant Maintenance Show, Cleveland, January 15-19

"... rebuilt head works just as good as a new head ... *and cheaper, too.*"

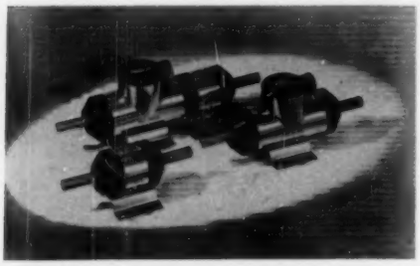
You can save time, money, and shutdowns by sending cracked or broken cylinder heads, blocks or castings of any kind to Guth for renewal. The exclusive Guth Fusion Process, taking into account the molecular structure of the metal, is guaranteed to restore your castings to *as-new* condition and strength. It works successfully on the most complex castings, of both ferrous and nonferrous metals. General Mills, Inc., like many other leading companies, saves time and money by using the Guth Renewal Service.

GUTH COMPANY
McPHERSON, KANSAS

SERVING THE NATION FROM ITS CENTER

You can get immediate shipment of popular Diesel heads and blocks under the Guth Exchange Plan. Write for details today.

Combination Units for Variable Speeds



The Metron Instrument Company has made available integral combinations of its standard miniature variable and fixed ratio drives. These combination units are small, completely sealed, packaged items which retain the features of their individual components. For very low power applications requiring both speed reduction and variable speed, these combination units deliver two pound-inches of torque. Applications include timers, recorders, controllers, computers, indicating mechanisms and similar devices.

By combining the variable ratio unit with the proper fixed ratio, a variable output speed is obtained at any desired nominal speed, and is infinitely adjustable from 1/6 to 6. For example, an 1,800 rpm. motor coupled to a combination unit having a four-section, 531,441 to 1 reduction gear unit will give a variable output speed of 0.6 revolutions per day to 20 revolutions per day. Or, if a single section, 2 to 1 reduction gear unit is used, all output speeds between 150 rpm. and 5,400 rpm. are available. Design features include ball bearing shafts, permanent lubrication, and sealed construction. The fixed ratio sections are available in extruded gears or hobbed gears, and can be obtained in any of hundreds of standard ratios.

New Tracto-Shovel

A new wrinkle in our accelerated housing program is this adaptation of an Allis-Chalmers Tracto-shovel to facilitate roofing on a 100-home project near North Bend, Oregon. A special home-made fork developed by the Bower-Edmonds Corporation, Portland builders, enables the HD-5G to hoist a half load of 16-foot sheetings and a bucketfull of asphalt shingles in one operation. This, of course, speeds up roofing considerably. Howard McCoy, Bower-Edmonds' job superintendent on the "Oregon Home" subdivision, explained that the HD-5G has several other assignments besides hoisting roofing material. It backfills basements, levels yards, and as soon as a new Tracto-motive trench-hoe, now on order, arrives it will dig sewer trenches. According to McCoy, the HD-5G is about the handiest tool he's found in the construction business in 32 years.

American Bearing Corporation Brings Out New Line

American Bearing Corporation is now in full production on an entirely new line of steel backed, copper-lead, precision bearings for diesel engines. The bearings are of standard construction, using copper-lead, metallurgically bonded to a steel back. Where engine conditions warrant or requires it, a precision, micro babbitt overlay, consisting of a mixture of lead, tin and copper, may be plated in the bore. The lead content of this new line of bearings varies from 15 per cent to 45 per cent, which range permits a suitable application for any diesel engine being built today. In addition to this full range of compositions American Bearing Corporation is now offering these modern bearings in sizes to fit journal diameters from 3 inches to 20 inches.

Widely known throughout the diesel industry for many years as manufacturers of "Satco" bearings, the American Bearing Corporation recognizes the advances in diesel engine design and operation in bringing out this improved line of heavy-duty, copper-lead, precision bearings.

FOR CLEAN OIL and CLEAN ENGINES

HILCO

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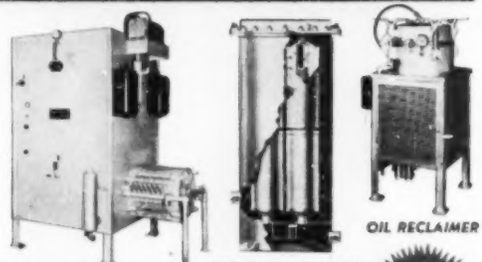

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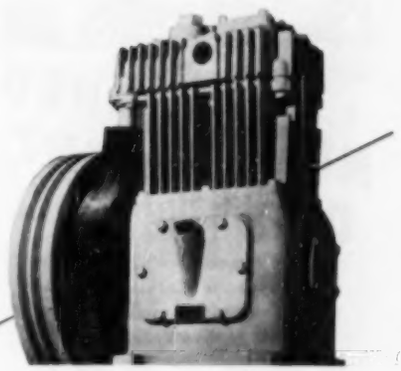
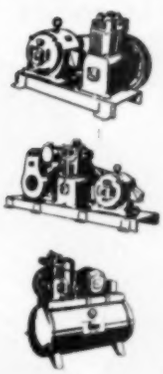


but the inside story of Quincy COMPRESSORS is even better!



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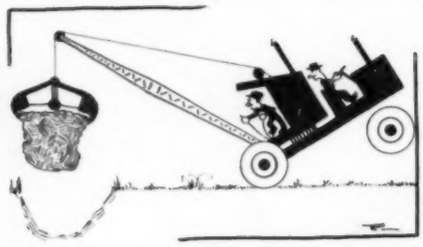

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WEST COAST DIESEL NEWS

By **FRED M. BURT**

FOR BELRIDGE Oil Co., of Los Angeles, two 1,100-hp. direct-connected gas compressor units from Cooper-Bessemer for use in the North Belridge oil field near McKittrick, Calif., to supplement two C-B 800-hp. motor driven compressors.

REFRIGERADORA del Noroeste at Mazatlan is Mexico's largest shrimp freezer, handling 120,000 lbs. last season; freezing capacity of 14 tons daily plus 25 tons of ice, utilizes for operating power five Fairbanks-Morse diesels from 60 to 100-hp.; three 7½x7½ Vilter compressors and one 9½x9½ Vilter.

THE FIRST vessel to be built in The Pacific Boatbuilding Co. yard in Tacoma since its purchase by Tacoma Boatbuilding Co. is a giant 144-foot tuna clipper designed by Arthur DeFever (San Pedro), to be powered with 1,600-hp. Fairbanks-Morse O.P. diesel driving through a 3:1 Pacific Western planetary reduction gear; auxiliaries are three General Motors series 110 diesels each driving a 100-kw. Delco generator; refrigeration with four Baker 6¼x6¼ compressors.

PURCHASED by Arizona Edison Co., a Worthington natural gas engine to power a 500-kw. General Electric generator for lights and power at Ajo, Arizona, home of employees of the Phelps-Dodge Corp. copper mine.

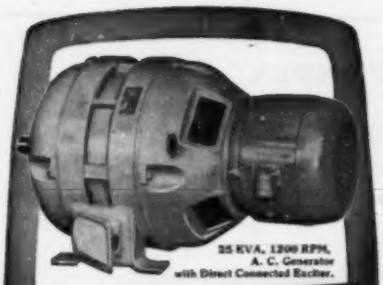
NEW LOWER California shrimp trawlers powered with Caterpillar diesels; owner, Nick Anguis, Punta Penasta, two 50-footers, 53-hp. and 80-hp.; 2:1 Twin Disc reduction gears; Victor Estrella, same location, using another 80-hp. unit with 3:1 Twin Disc; and two other 35-foot trawlers at Santa Rosalia with 120-hp. diesels and Twin Disc gears.

THE NEW service manager for Cummins Diesel Sales Corp. of Seattle is Paul Phillips, previously regional service manager for Cummins Engine Co. Bradley Barlett, well-known in the Northwest as a marine diesel sales engineer, will introduce the new company's sales and service policies in the marine field, also making an extensive trip through Alaska to ascertain sales needs and potentialities.

THE FELLOWS & Stewart shipyard, one of the oldest in Southern California, is moving from its long time Terminal Island location to another one previously held by wartime California Shipbuilding Corp. To use two docks and about five acres of land, also building a 1,000-ton floating drydock.

PURCHASED from Shaw Sales and Service Co., Los Angeles, three K-360 Link-Belt Speeder draglines powered with 142-hp. Caterpillar diesels, by Blue Diamond Corp. for use in their South Alameda St., Los Angeles, yard (1), and the others at their El Monte plant.

THE *CLERMONT*, 74-foot purse seiner, owner John Evich, re-powered with tandem twin General Motors diesels, 4:1 reduction, GM hydraulic



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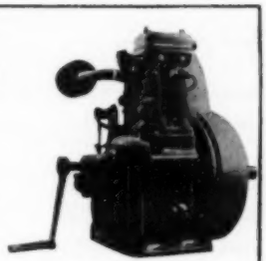

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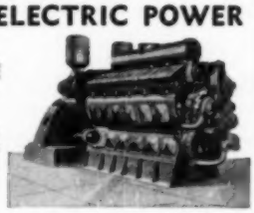

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gear; sold by Crofton Diesel Engine Co., San Pedro, installed by the J & B Engine Service, San Pedro.

PURCHASED by Asbury Transportation Co., Los Angeles, for use by their trucking line, six new Mack trucks, Model LTLSW, each powered with NHB-600, 200-hp. Cummins diesels.

BUILT from modified plans of H. C. Hanson, Seattle, by Sterling Shipyards, B. C., for The Canadian Fishing Co., three sister 65-foot seiners: *Cape Devon*, powered with a 230-hp. Buda diesel; *Sea Master*, 250-hp. Buda; *Cape Dorset*, 215-hp. Caterpillar.

PURCHASED by H. B. Adair, Los Angeles contractor, five HD-19 Allis-Chalmers tractors powered with 165-hp. General Motors diesels; by Haddock Engineers, Lt., Los Angeles, two HD-19's, also from Shaw Sales & Service Co., Los Angeles.

A NEW 150-foot wooden tuna clipper under construction by Campbell Machine Co., San Diego, for Capt. Joe S. Rogers and nine associates, will be powered with a 6-cyl., 840-hp., supercharged Union diesel; auxiliaries two 190-hp. Union diesels direct-connected to 150-kw. generators.

The *Sea Cloud*, yacht at Newport Beach, Calif. Owner, Mr. Ralph Hemphill, of the West Coast University, 1601 Western, Los Angeles. Crofton 2-cylinder, Model 10/2, 10 bhp. diesel, equipped with electric starter, marine raw water pump—driving a 5-kw., 115-volt ac., 1,200-rpm. Kato-Light generator.

The *Janet* (Kettenburg Boat). Owner, Mr. Antone Zanze, San Pedro, Calif. Crofton 2-cylinder, Model 10/2, 10 bhp., auxiliary on ice machine, bait pump and small generator.

The *Lucky Strike*. Owner, Mr. V. C. Jubb, Portland, Oregon. Crofton 1-cylinder, Model 5/1, 5-7 bhp., with fresh water cooling system. Lipman water cooled freon compressor, belt driven off of Crofton engine, complete with service valves and oil charge and gauges. Base for both units incorporating a V-belt drive and water pump with monel shaft. Evaporator coil of 1-inch galvanized pipe set on apron, 8-inch centers properly blocked away from hull and fed by two automatic expansion valves, water cooled condensor suitable for installation along with a glass "low liquid indicator."

The *Shirley Kay*. Sale of engine to Welcome Motor Co. (W. M. Hamon), 6110 Ferguson Drive, East Los Angeles, Calif. Crofton 1-cylinder, Model 5/1W, 5-7 bhp., with marine water pump and small heat exchanger.

TO THE Arizona Edison Company, of Phoenix, for added power at their Douglas, Ariz., plant, a new Cooper-Bessemer LS-8, gas-diesel turbocharged, 1,095-kw (at 3,900-foot altitude) generator unit; for Apache Powder Co., Benson, Ariz., a 330-hp. direct-connected, natural-gas powered compressor unit to supply compressed air for plant operations.

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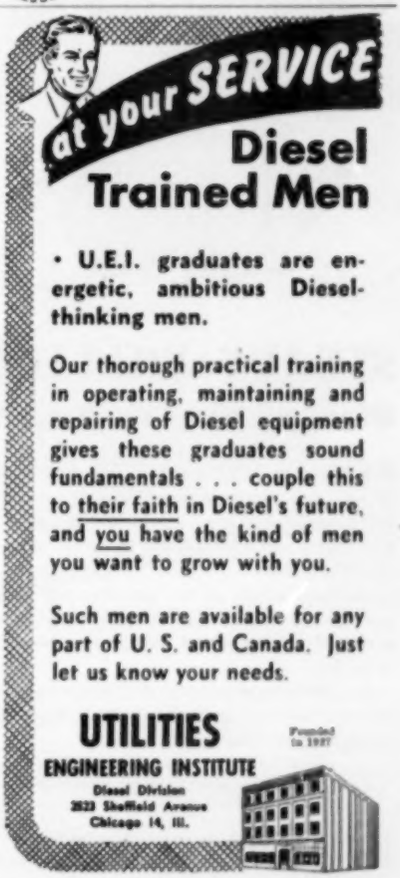

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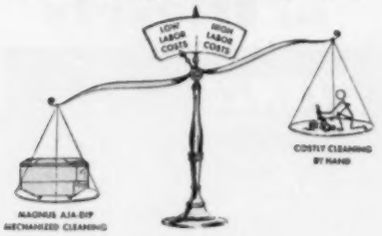

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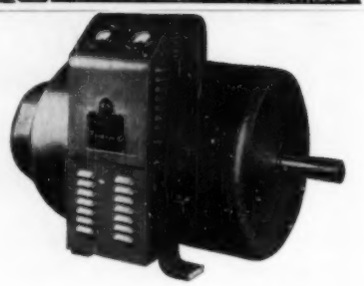

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from a given size Diesel with the...

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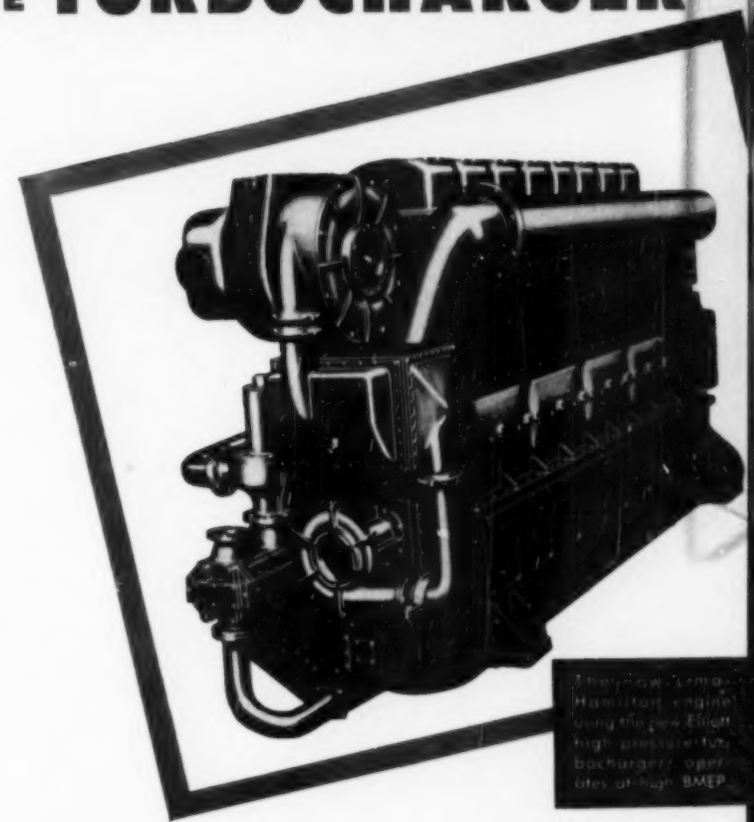
ELLIOTT HIGH-PRESSURE TURBOCHARGER

The introduction of the Elliott-Buchi turbocharger in this country in 1940, created a new conception of 4-cycle Diesel engine horsepower capabilities. Air delivered under pressure to the cylinders increased the amount of fuel burned economically, improved combustion efficiency, increased horsepower, and lowered maintenance cost.

The orginal Elliott-Buchi turbocharger quickly proved that it could increase the horsepower of a given engine up to 50 percent over the original non-supercharged rating; this meant BMEP up to 120. Now progress in the engine-building art permits higher BMEP and higher output per cylinder.

The new Elliott high-pressure turbocharger has actually been in use for some time. An example is the Lima-Hamilton engine, illustrated, which is typical of new designs of four-cycle Diesels operating at BMEP of 165. The new turbocharger incorporates design improvements insuring long life, trouble-free operation, and ease of maintenance.

Full details at your request. Write.



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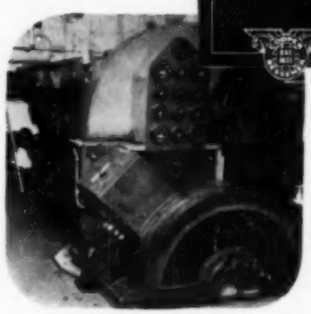
Your plans for building or repowering will be better plans, too, if they include reliable, highly efficient Cooper-Bessemer engines.



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